Population movements into Europe during the Pleistocene: a comparative approach

Grimshaw, Lucinda Celia

Population movements into Europe during the Pleistocene: a comparative approach.

Lucinda Celia Grimshaw

Ph.D. Thesis

University of Durham

Department of Archaeology

2004

Volume Two of Two Volumes

Table of Contents

List of Figures

V

List of Tables

Chapter 8 : Temporal and spatial patterns in the Aurignacian data.

The Upper Palaeolithic data presentation follows a similar format to that of the Lower Palaeolithic, with the intention of making these chapters easily comparable. This chapter will present the temporal and spatial patterns of the existence of the Aurignacian, with the aim of establishing the timing and extent of the spread of early modern humans into Europe. A brief discussion of the nature of the Upper Palaeolithic data and its analysis will begin the chapter, followed by the presentation and discussion of the Aurignacian temporal and spatial data. The problems of the use of radiocarbon dates will be examined, and the issues surrounding the identification of Aurignacian industries will be considered. The implications for the detection of movement processes, such as exploration, will then be discussed.

The Upper Palaeolithic data and analysis.

The investigations into the patterning of the Upper Palaeolithic data were made as similar as possible to the analysis of the Lower Palaeolithic, in order to produce comparable results. The maps were created using the same digital data, projected in the same manner as the Lower Palaeolithic spatial analysis, described in Chapter 5. The statistical tests of each variable in the database were identical to those applied to the Lower Palaeolithic data, with the exceptions described below. All the analysis of the dates used the six date categories defined in Chapter 4, and was undertaken at the three levels of certainty of Aurignacian presence unless otherwise stated.

The Upper Palaeolithic data analysis suffered fewer problems relating to small sample sizes than the Lower Palaeolithic material. All the sites in the database were dated to the same level of certainty; therefore, the only variation in the reliability of the results concerns the effect of changing the level of confidence in the assemblages reflecting genuine Aurignacian material. The early Upper Palaeolithic industries that were not definitely Aurignacian, and dated to the beginning of the study period, could be transitional industries such as the Chatelperronian that have been connected to the final Neanderthals in Europe, and thus do not represent the processes of movement of modern humans into Europe, instead being potentially related to interactions and acculturation between the Neanderthal and *Homo sapiens* groups. Alternatively, the early Upper Palaeolithic material could represent remains left by anatomically modern human groups, perhaps related to the processes of movement undertaken by these groups, or to specialised activities resulting in unusual assemblages (Adams 1998). The material designated as unlikely to be Aurignacian, which dates to the end of the study period, could be related to the processes of the appearance of the industries that succeed the Aurignacian. Those assemblages that were clearly not Aurignacian, and were either Gravettian or the final Neanderthal industries, were excluded from the dataset. Therefore, these problems were minimised, but remain a factor in the interpretation of the data because small assemblages that lack diagnostic tool forms cannot be excluded from the possibility of manufacture by Aurignacian groups. The investigation into the patterning of the data will address these problems, as well as the processes of movement that are revealed.

When did the Aurignacian appear in Europe?

The Aurignacian temporal data.

The full list of sites dated to each of the date categories, at each level of certainty of Aurignacian presence, is presented in Appendix 3. Figures 8.1-8.3 show the distribution of Aurignacian sites over time, which reveals that the Aurignacian had definitely arrived in Europe by 40,000 years ago, and was already present in a large number of sites by this date. Therefore, between 43.5-40 Kyr BP the first Aurignacian sites appeared in Europe. Increasing the certainty of attribution to the Aurignacian results in the numbers of sites decreasing, especially after 29.5 Kyr BP. The distribution of Aurignacian site numbers over time is slightly skewed towards the older date categories, suggesting a gradual increase in Aurignacian presence until 36.5-33 Kyr BP, and then a more rapid decline, with few sites younger than 29.5 Kyr BP.

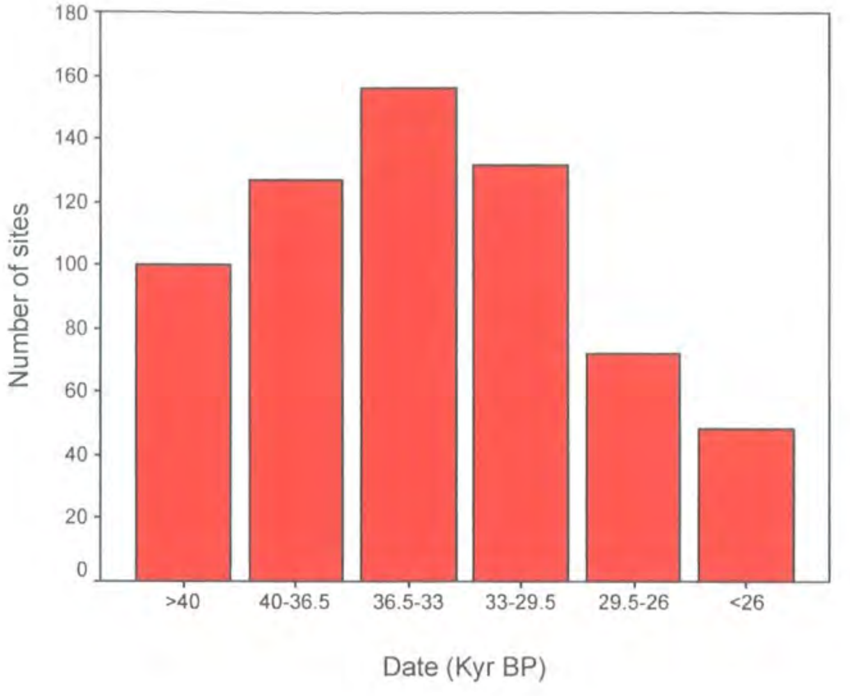

Figure 8.1. Chart showing the number of all possible Aurignacian sites in each date category.

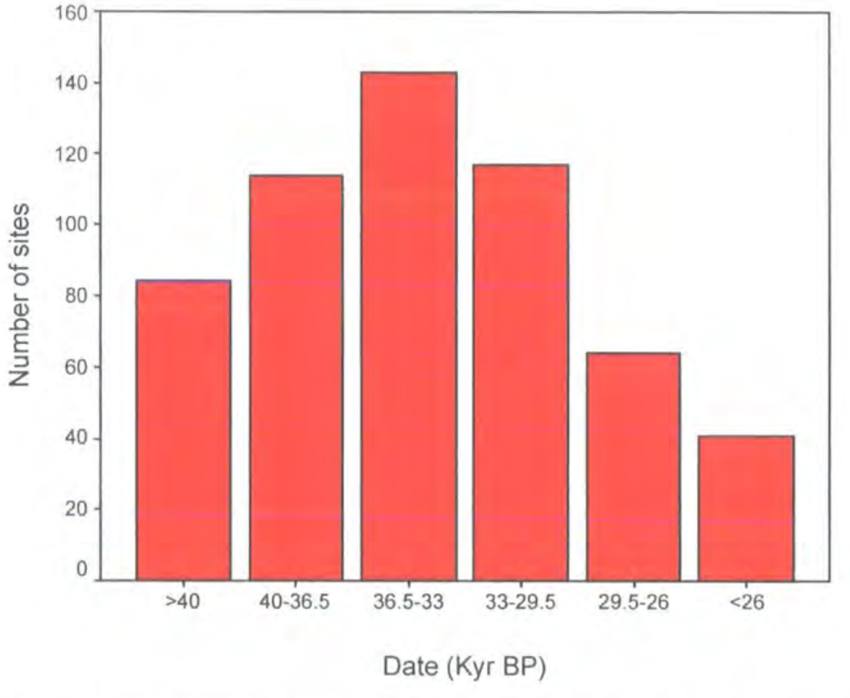

Figure 8.2. Chart showing the number of probable and definite Aurignacian sites in each date category.

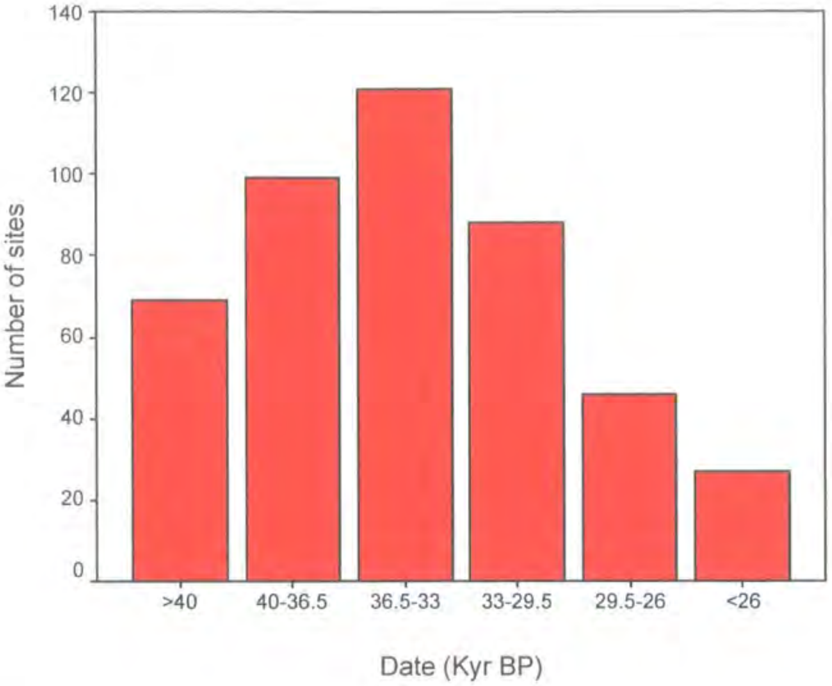

Figure 8.3. Chart showing the number of definite Aurignacian sites in each date category.

Dating Aurignacian presence.

All the sites in the database have a date, and therefore there are no problems with the sample of the data used in the analysis. However, at the time of the Aurignacian the standard deviations of radiocarbon dates are large, and some sites are dated to all six divisions of the dates when two standard deviations are considered. This problem is related to the age of the Aurignacian being near the limits of radiocarbon dating, and cannot presently be overcome. The date categories were designed to minimise the problem of sites being placed in several of the divisions, and provided the minimum number of multiple attributions possible given the breadth of the dating accuracy. Moreover, these divisions allowed six categories to be created, providing the possibility of producing meaningful patterning. A broadening of the categories would have resulted in slightly fewer sites being assigned to multiple divisions, but would have produced fewer divisions, and thus would have prevented potential patterning relating to movement from being detected. For example, divisions of 5000 years would have produced a small increase in the number of sites falling within a single date category, but would have divided the Aurignacian into only four date categories, potentially destroying the possibility of detecting differences between the earliest sites and the main Aurignacian occurrences. Therefore, the six divisions used provide the best date range available, when the full range of the dates at two standard deviations are used. The use of a single standard deviation, or even the centre point of the dates, would substantially lower the chances of the dates being correctly assigned, and therefore would actually decrease the strength of the results by increasing the chances of producing false patterning (Pettitt 2000; Pettitt and Pike 2001).

The calibration of the radiocarbon dates also creates potential inaccuracies, but the calibrated dates were used in order to allow comparison between dates obtained by all absolute techniques (van Andel *et al.* 2003b), given the fact that radiocarbon at this time range appears to consistently provide younger dates than other methods (Pettitt 1999). The dates used in the analysis were the calibrated dates quoted in the Stage Three Project database, which used the CALPAL calibration of radiocarbon dates with the default calibration curve (van Andel *et al.* 2003b). Dates that were questioned in the Stage Three Project database or the original published reports due to being outliers, having poor sample quality, or poor connections to the Aurignacian material at the sites were discarded from the analysis. This procedure intended to provide a large database of dates that could be accepted as good quality indicators of the timing of Aurignacian arrival in Europe, without actively selecting or rejecting sites to fit a chronological agenda. Therefore, it remains likely that some or all of the dates used suffer from inaccuracies, but this methodology offers the best means possible of analysing patterning in the dates without producing false results (Pettitt pers. comm.).

The dates shown in Figures 8.1-8.3 reveal that the Aurignacian is already present in Europe by 40 Kyr BP in high numbers of sites, and steadily increases until 36.5-33 Kyr BP. After this peak, the numbers of Aurignacian sites rapidly decrease. The definitely Aurignacian sites show a stronger skew towards the earlier periods than the less confidently identified material. The addition of the undiagnostic EUP sites results in a greater number of late sites, suggesting that these assemblages may be Gravettian, or that distinctively Aurignacian artefacts decline rapidly after 33 Kyr BP, perhaps related to the reduction in assemblage sizes, discussed in Chapter 10 (Figure 10.1, page 437). However, the majority of Aurignacian artefacts varied in prevalence over time in the same fashion as the number of Aurignacian sites, and therefore no trend towards a loss of diagnostic elements is seen in the artefact data presented in Chapter

10. The addition of the unlikely Aurignacian sites has less of an effect on the distribution of sites over time among the earlier date divisions, which could be interpreted as there being less possibility of confusing the transitional industries, than the Gravettian, with the Aurignacian; or that fewer Aurignacian sites lacked diagnostic tools in the early periods.

The small number of undiagnostic EUP industries at the beginning of the time of Aurignacian occurrence implies that any exploratory behaviour associated with ephemeral sites and rapid long distance movement was restricted to few occurrences. Nevertheless, the rapid appearance of the Aurignacian between 43.5-40 Kyr BP suggests that exploration may have occurred before these dates, as rapid spread is unlikely to be sustainable without an element of exploration. However, the appearance of so many sites in the earliest phase of Aurignacian existence results in difficulties in tracing the processes of movement through site numbers alone, as the movement appears to be instantaneous in the radiocarbon chronology, contra Bocquet-Appel and Demars (2000) and Mellars (1996; 1998; 1999). However, given the problems associated with radiocarbon dates at this time range, it is possible that a phase of low site numbers preceded the major occupation, but cannot be detected at the current level of dating resolution.

Where was the Aurignacian present in Europe?

The Aurignacian spatial data.

Figures 8.4-8.21 present maps of Aurignacian sites in Europe during each of the six date categories and at each level of certainty of Aurignacian presence. The sites dated >40 Kyr BP are displayed in Figures 8.4-8.6. These maps reveal that the Aurignacian was already widely dispersed across Europe in its earliest phase. However, Figure 8.4 demonstrates that definite Aurignacian sites are not found in the earliest phase in southwestern Iberia, Greece and the Adriatic coast, with the exception of Italy. Britain, Italy and northeastern Europe contain very few definitely Aurignacian sites. Clusters of definitely Aurignacian sites can be seen in southwestern France, the northern Spanish coast, the Po Valley and the Czech Republic. Figure 8.5 adds the probable Aurignacian sites, which expands the evidence of occupation in Britain, the Levant, and Central Europe. The addition of the possible Aurignacian EUP sites shown in Figure 8.6 includes occupation of southern Iberia and Italy, and increases the Upper Palaeolithic presence in Britain, the Levant and Central Europe.

Figure 8.4. Map showing the definite Aurignacian sites dated >40 Kyr BP.

Figure 8.5. Map showing the probable and definite Aurignacian sites dated >40 Kyr BP.

Figure 8.6. Map showing all the possible Aurignacian sites dated >40 Kyr BP.

Figures 8.7-8.9 show the locations of the Aurignacian sites dated between 40-36.5 Kyr BP. Figure 8.7 demonstrates that Aurignacian presence had definitely spread into the Levant, Eastern Europe and southern Italy by this period. Additionally, more substantial occupation of southwestern France, northern Spain and southern Germany can be seen. Moreover, clusters of sites were located in many more areas, including southern Germany and Austria, the French Mediterranean coast, and southern Italy. The areas that remained unoccupied by the Aurignacian were southern Iberia, Greece, the Balkan Adriatic coast, and most of Britain and northeastern Europe. The areas that show a low level of occupation are the Levant, northern Germany and northeastern Europe. The addition of less definitely Aurignacian sites results in greater representation in areas beyond the core, in Britain and southern Iberia, as well as more sites within the areas with substantial occupation, such as southern Germany and the Czech Republic.

Figure 8.7. Map showing the definite Aurignacian sites dated between 40-36.5 Kyr BP.

Figure 8.8. Map showing the probable and definite Aurignacian sites dated between 40-36.5 Kyr BP.

Figure 8.9. Map showing all the possible Aurignacian sites dated between 40-36.5 Kyr BP.

Figures 8.10-8.12 display the Aurignacian sites during the period of 36.5-33 Kyr BP, which formed the time of maximum Aurignacian presence. Figure 8.10 presents the evidence that Aurignacian sites had spread into the Crimea, the Balkan Adriatic coast and northwestern France by this period. The clustering of sites in the areas of core occupation occurred in the same regions as previously. The areas that remained unoccupied by definite Aurignacian groups were southern Iberia, Greece and the southern Adriatic, Anatolia, and most of Britain and northeastern Europe. The addition of the less certainly Aurignacian sites shows occupation of southern Spain, northeastern Europe and the British Midlands.

Figure 8.10. Map showing the definite Aurignacian sites dated between 36.5-33 Kyr BP.

Figure 8.11. Map showing the probable and definite Aurignacian sites dated between 36.5-33 Kyr BP.

Figure 8.12. Map showing all the possible Aurignacian sites dated between 36.5-33 Kyr BP.

Figures 8.13-8.15 show the location of the early Upper Palaeolithic sites dated to 33-29.5 Kyr BP. This period saw the beginning of the decline in numbers of Aurignacian sites. The maps demonstrate that consolidation of occupation took place in the areas already occupied, with infilling between pre-existing regions of Aurignacian presence, such as northern and southern Italy, northern and southern Germany, and within northern France. This period also witnessed the expansion of definite Aurignacian presence in the Balkans and Eastern Europe. However, the Aurignacian remained absent from southern Iberia, Greece and the southern Adriatic coast, Anatolia and most of northeastern Europe and Britain. The addition of the EUP sites that are not clearly Aurignacian places occupation in southern Iberia, midland Britain and Eastern Europe. The number of sites in Central and Eastern Europe is also boosted substantially by the addition of the less diagnostic EUP sites.

Figure 8.13. Map showing the definite Aurignacian sites dated between 33-29.5 Kyr BP.

Figure 8.14. Map showing the probable and definite Aurignacian sites dated between 33-29.5 Kyr BP.

Figure 8.15. Map showing all the possible Aurignacian sites dated between 33-29.5 Kyr BP.

Figures 8.16-8.18 show the distribution of Aurignacian sites dated to the period between 29.5-26 Kyr BP. During this period the major decline in numbers of Aurignacian sites took place, and the maps reveal the disappearance of Aurignacian groups from southeastern Europe, Central Europe, northern France and most of Italy. There are no areas initially colonised at this time, and southern Iberia, most of Britain and northeastern Europe were still not occupied by Aurignacian groups. The maps of EUP sites lacking diagnostically Aurignacian material expand the area of occupation further into Britain and Iberia, and increase the number of sites in Central and Eastern Europe.

Figure 8.16. Map showing the definite Aurignacian sites dated between 29.5-26 Kyr BP.

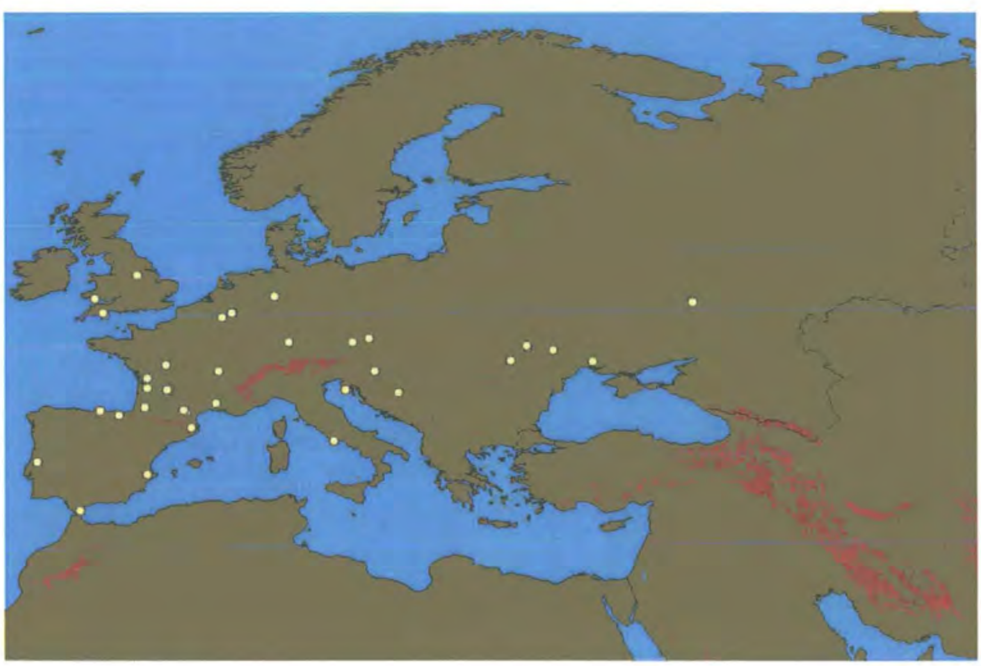

Figure 8.17. Map showing the probable and definite Aurignacian sites dated between 29.5-26 Kyr BP.

Figure 8.18. Map showing all the possible Aurignacian sites dated between 29.5-26 Kyr BP.

Figures 8.19-8.21 present the evidence for the youngest Aurignacian sites, dated to later than 26 Kyr BP. This period has very few definite Aurignacian sites, shown in Figure 8.19, but occupation spread further north in Russia and into southern Iberia, although central Iberia remained unoccupied. This patterning suggests that the former core areas were abandoned and Aurignacian settlement spread further into the peripheral areas. The maps including the less diagnostic EUP sites shown in Figure 8.20 and Figure 8.21 do not reveal this abandonment of large areas of Europe.

Figure 8.19. Map showing the definite Aurignacian sites dated later than 26 Kyr BP.

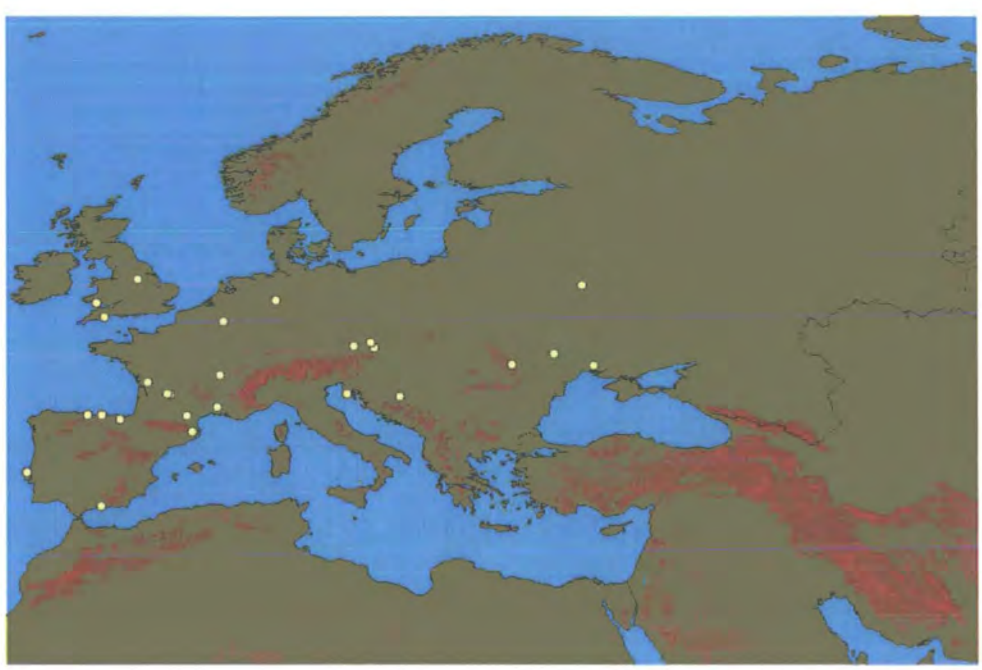

Figure 8.20. Map showing the probable and definite Aurignacian sites dated later than 26 Kyr BP.

Figure 8.21. Map showing all the possible Aurignacian sites dated later than 26 Kyr BP.

Spatial patterning in Aurignacian presence.

The Stage Three Project database provided spatial locations for all the sites, and therefore the spatial data can be considered to be representative of the dated occurrences of the Aurignacian. Moreover, the database contained over 650 entries of Aurignacian dates, and thus is extensive enough to provide a comprehensive sample of the spatial patterning of the Aurignacian. However, as the Stage Three Project data was compiled using the logic that the dating was the most critical element, it excluded Aurignacian sites that lack absolute dates. Therefore, the lack of Aurignacian sites in certain regions may be a consequence of their dating, rather than an actual absence (van Andel *et al.* 2003b). Nevertheless, the absence of the Aurignacian from the Iberian Peninsula to the south and west of the Ebro river has been highlighted in several studies (d'Errico *et al.* 1998; d'Errico and Sánchez Goñi 2003; Mellars 1998, 1999; Vaquero and Carbonell 2000), which suggests that the regions revealed to be lacking Aurignacian sites were genuinely not occupied, and that the Stage Three Project data does include a representative spatial sample of Aurignacian occurrences.

The spatial patterning highlighted in Figures 8.4-8.6 reveals that Aurignacian sites appeared across a wide area of Europe by 40 Kyr BP contra d'Errico *et al.* (1998) and Zilhão and d'Errico (1999), and the assemblage size distributions presented in Chapter 10 (Figure 10.2 and Figure 10.3, pages 439-440) show that these early Aurignacian sites were large in all the areas occupied. Therefore, it is not possible to trace a movement from east to west across Europe in the timing of the first appearance of the Aurignacian, when the dates are considered at two standard deviations, contra Bocquet-Appel and Demars (2000) and Mellars (1996; 1998; 1999). However, the absence of early Aurignacian material in the Iberian Peninsula beyond the "Ebro Frontier" (d'Errico *et al.* 1998) demonstrates that Aurignacian groups did not move into Europe from North Africa via the Straits of Gibraltar, contra van Andel, Davies and Weninger (2003a). Thus, despite the lack of a cline in the dates of Aurignacian appearance, a route of entry from the east must have applied.

Over time the zone of Aurignacian presence expanded, and the number of sites in the area of early occupation increased. Aurignacian sites spread into the Levant and the Adriatic coast by 36.5-33 Kyr BP, the time of the greatest number of Aurignacian sites. However, definitely Aurignacian finds do not occur in southern Iberia until after 26 Kyr BP, and Greece lacks Aurignacian sites entirely. These areas are on the periphery of the core region of occupation in Central Europe, southern France, northern Spain and northern Italy; hence, their geographical remoteness may explain their late occupation, as problems of access may have limited spread. Furthermore, the low levels of occupation of these regions could indicate that they were still undergoing colonisation during the study period, as widespread exploration is expected to precede established settlement. However, the presence of large sites in these regions, discussed in Chapter 10, undermines the explanation by exploration, because pioneering sites are expected to be small due to the small groups and high mobility associated with the initial stage of migration. Alternatively, these regions may have been occupied by large Neanderthal populations that prevented the spread of the modern human groups through competition (Mellars 1996). However, the issues of the interaction between Neanderthals and modern humans go beyond the scope of the analysis of this data.

The spatial extent of the Aurignacian does not directly correlate with the number of sites over time. As the number of Aurignacian occurrences increases, the area occupied and the density of finds in the core regions increases; however, as the Aurignacian declines, further spread into peripheral areas occurs as the core regions underwent abandonment. Thus, the movement of the Aurignacian was not dependent on population density, and did not follow a simple wave-front pattern. Bocquet-Appel and Demars (2000) suggest that spread occurred from independent regional centres, in a manner analogous to the patch colonisation of a metapopulation forwarded by ecological biogeography. Some evidence for this suggestion is seen in the presence of clusters of large sites within the core area of occupation, although the degree to which these were independent or within a single social network cannot be determined from the spatial distribution data alone, and the possibility remains that this pattern reflects a chain migration process of movement directed towards nodal locations, following the observations of sociological models of modern human movements.

The appearance of Aurignacian sites in Anatolia and the Levant substantially later than in Europe could be explained by the phenomenon of return migration, if these areas were the origin of the anatomically modern human groups in Europe, as suggested by Mellars (1996), shown in Figure 8.22. Sociological and geographical models of migrations have detected a consistent pattern of migrants returning to their area of origin once their objectives at the destination have been achieved (Tilly 1978; Oberai and Singh 1983; Kearney 1986; Massey and Espinosa 1997; Foulkes and Newbold 2000; Lin and Liaw 2000), although over shorter timescales than that of the Aurignacian. In a mobile hunter-gatherer population, potentially with very high levels of mobility, it seems likely that movement would not always direct settlement towards Western Europe, assuming an origin of the Aurignacian does lie in Eastern Europe or Western Asia. However, the origin of the Aurignacian population could have been in areas of Western Asia other than the Levant (Otte and Derevianko 2001), in which case the late emergence of the Levantine Aurignacian would represent a process of spread into the periphery surrounding the Central European core.

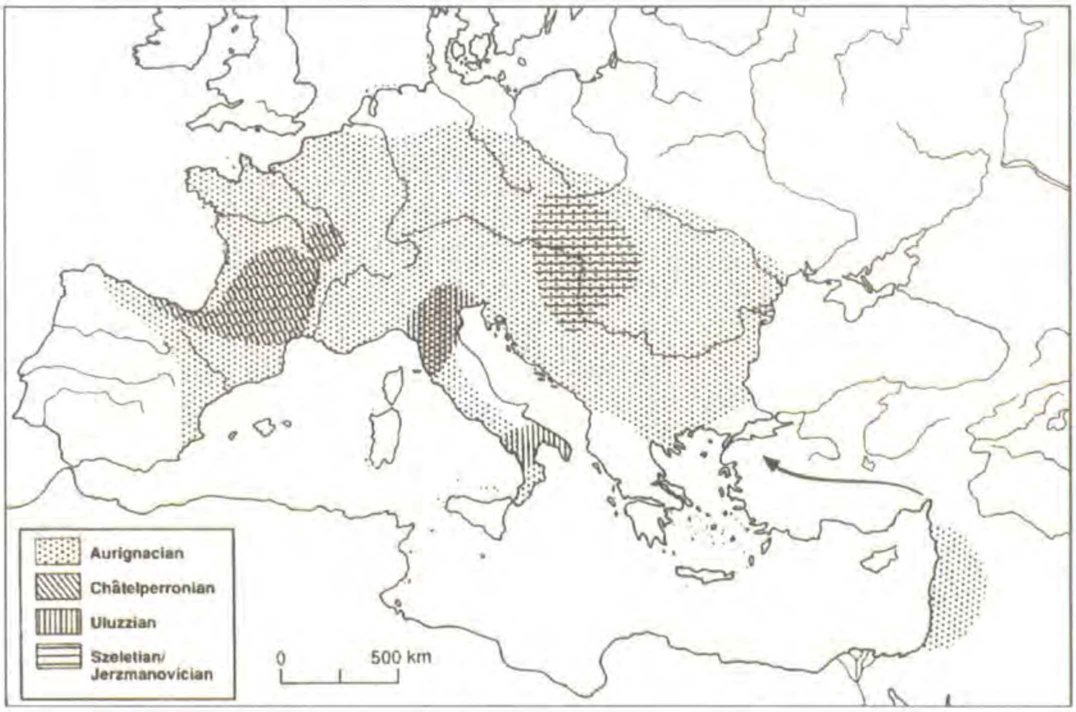

Figure 8.22. Map showing the geographical distribution of the Aurignacian, illustrating the movement of the Aurignacian from the Levant to Europe. (After Mellars 1996)

The addition of the sites containing undiagnostic EUP assemblages adds to the area occupied throughout the duration of the Aurignacian. In the early phases the regions containing undiagnostic and mainly small assemblages are Britain, southern Iberia, southern Italy, and the Levant. It is possible that these sites were not part of the Aurignacian expansion across Europe, and that they represent Neanderthal presence. Alternatively, these sites could be explained by exploration beyond the core areas of Aurignacian habitation, involving small groups moving rapidly and leaving ephemeral traces with a limited range of tool types, such as endscrapers, burins and unretouched blades, which are characteristic of the Upper Palaeolithic but not uniquely Aurignacian, thus creating the uncertainty in the attribution of these assemblages. In the later phases the small undiagnostic assemblages are mainly located in Eastern Europe, the area of Gravettian development (Otte and Keeley 1990), and hence could be explained by the emergence of this techno-complex and the decline of Aurignacian presence in this region. A further possible explanation of this patterning is that the core area of Aurignacian habitation had retreated from Eastern Europe, but small groups remained or visited this region. Some undiagnostic assemblages are found within the core areas of Aurignacian presence, and raise the number of sites in each region, reinforcing the clustering of the population, and joining together zones of occupation. It seems unlikely that these sites within the core Aurignacian territory could represent Neanderthal groups, and thus these assemblages support the presence of modern humans at sites that lack the distinctive Aurignacian "type fossils".

Conclusions.

In conclusion, the temporal and spatial patterns of occurrence of the Aurignacian show that *Homo sapiens* occupation of Europe was established in the core region of Aurignacian presence by 40 Kyr BP. This indicates either that the initial movement into Europe was extremely rapid, or that slow movement has not been detected due to the problems of radiocarbon dates at this time depth causing the compression of older sites together at the younger age of 40 Kyr BP. Alternatively, slow movement may have occurred before the development of the Aurignacian, and therefore is not detected because the archaeological traces of the first *Homo sapiens* groups in Europe cannot be distinguished from the late Mousterian Neanderthal industries. Nevertheless, the spatial data show that gradual spread into the peripheral areas of Europe did occur, and therefore that it may be possible to access the processes of movement during the early Upper Palaeolithic through the archaeological record. These issues will be further explored in the following two chapters concerning the ecological and physical environmental context of movement, and the behaviours of the Aurignacian groups.

Chapter 9 : Physical environmental and ecological context of movement of the Aurignacian.

This chapter will address the landscapes and environments occupied over time by the Aurignacian groups during their movement across Europe, and also the ecological context in which movement took place. The environment during OIS 3 has been given as a reason for the timing of the arrival of *Homo sapiens* but the landscapes and local environments occupied have not been specifically investigated with respect to the influence these factors may have had on the spread of early modern humans. The ecological context of the Upper Palaeolithic has been studied with the aim of determining the causes of the megafaunal extinctions at the end of the Pleistocene, and the demise of the Neanderthals. However, the question of whether the movement of *Homo sapiens* into Europe was accompanied by other species or not, has not been addressed. Therefore, this chapter aims to determine whether the ecological conditions in Europe can be seen to have facilitated the movement of the Aurignacian, in a similar fashion to the faunal turnovers and dispersals that occurred during the Lower Palaeolithic movement discussed in Chapter 6. The data concerning the landscapes occupied by Aurignacian groups will be presented, followed by the environmental data, and finally the faunal data.

What landscapes were occupied by Aurignacian groups?

The Aurignacian landscape data.

The landscape data suffered from the problem that 34% of the sites lacked information regarding the surrounding landscape in the published record. Therefore, there is a possibility that this data is not representative of the true relationship between the landscape and date or assemblage size of Aurignacian sites. However, no regional or temporal biases seem to determine which sites lack landscape data, thus the sample of sites with this information can be regarded as viable.

The null hypothesis that there is no relationship between the date of an Aurignacian site and the landscape in which it is located was examined using chi-squared and lambda tests, which produced no valid results for chi-squared, and no significant values of lambda at all levels of confidence in the presence of the Aurignacian. Therefore, the null hypothesis is upheld and there is no patterning in the landscape types surrounding Aurignacian sites over time. Figure 9.1shows the landscapes of the definitely Aurignacian sites during each date category. This reveals that the vast majority of Aurignacian sites were located in river valleys, and few were found in coastal, mountainous or hilly areas in all periods except the youngest, when all the sites were located in riverine landscapes.

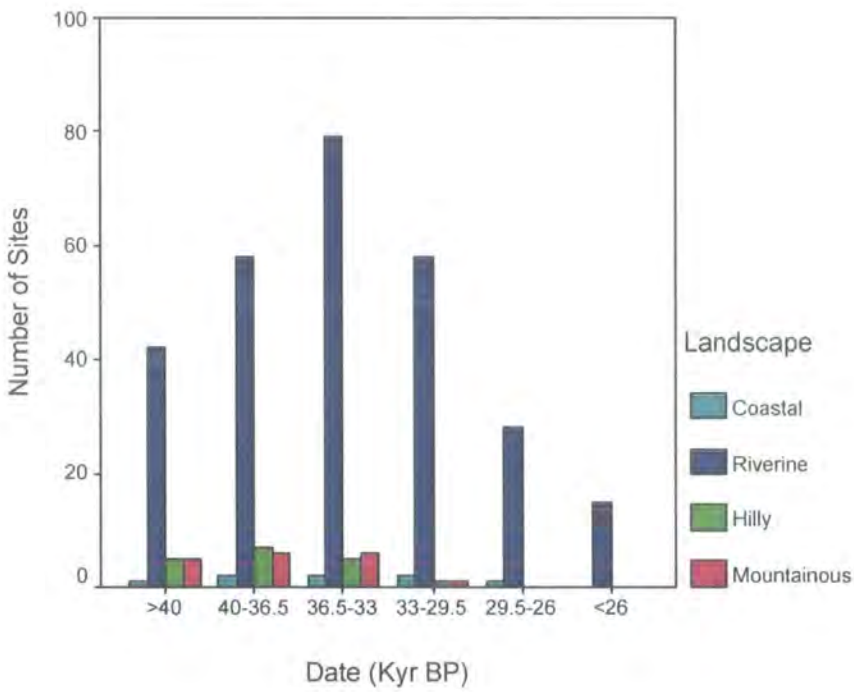

Figure 9.1. Chart showing the number of definite Aurignacian sites in each landscape type during each date category. N=324.

The assemblage sizes recovered at the Aurignacian sites were examined with the aim of establishing whether the intensity of occupation of the landscape types varied. The null hypothesis that the assemblage size of a site is not related to the landscape at the site was investigated using chi-squared and lambda tests, with the assemblage sizes divided into categories of: 0-10, 11-50, 51-100, 101-1000, >1000 artefacts. The chi-squared tests were invalid, and insignificant results for the definite Aurignacian assemblages, but lambda produced significant values for the undiagnostic possible

Aurignacian EUP datasets, with lambda=0.169 (α.=0) for the possible Aurignacian sites, and lambda=0.177 (α=0) for the probably Aurignacian dataset. Therefore, there is an association between the size of an assemblage and the landscape in which it is located, for the possible and probable Aurignacian sites, but not for the definite Aurignacian sites. Figure 9.2 displays the number of all possibly Aurignacian EUP sites in each landscape type, divided into the assemblage size categories. This reveals that all sizes of assemblages are found in riverine landscapes, whereas the less commonly occupied landscapes mainly contained larger assemblages.

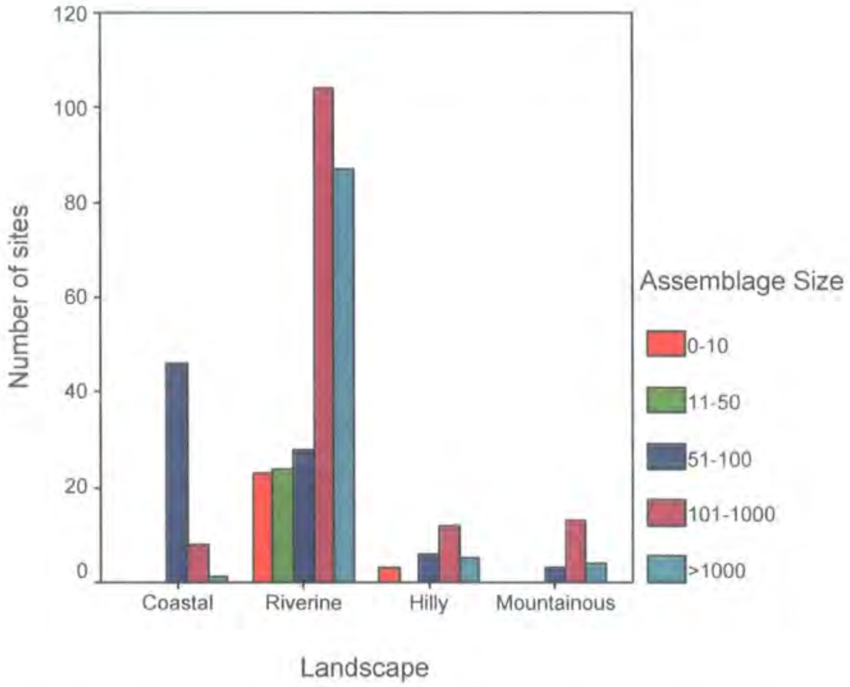

Figure 9.2. Chart showing the number of all possible Aurignacian sites in each landscape type, divided by assemblage size. N=367.

The potential differences in the landscapes surrounding Aurignacian and faunal sites were investigated, with the aim of establishing whether Aurignacian groups inhabited a representative range of the landscapes present in Europe, using the assumption that the faunal sites were located in representative European landscapes. Chi-squared and lambda tests were applied to the null hypothesis that there are no significant differences between the landscapes of the Aurignacian and faunal sites. The chi-squared tests produced invalid results, and lambda =0 (α=1.0) at all levels of certainty of the archaeological material being Aurignacian. Therefore, there is no difference between the landscapes surrounding the faunal and the Aurignacian sites.

Landscapes occupied by Aurignacian groups.

There is no significant relationship between landscapes occupied by Aurignacian groups and their date, at all times riverine areas are the most heavily occupied, with few sites in coastal, hilly or mountainous areas, and none in lakes, high plateaux or plains. The lack of temporal patterning could be explained by the broad range of the dates of Aurignacian sites, resulting in a blurring of the potential relationship between date and each factor. Thus, a relationship may have existed, which has been destroyed by the poor date resolution. Nevertheless, the presence of sites in all the landscape types that were occupied from the earliest date division suggests that diverse conditions were inhabited from the time of Aurignacian appearance in Europe, because a greater skew towards later dates for the occupation of some landscapes would be expected if the date resolution is obscuring a sequence of landscape occupation over time. Figure 9.1 demonstrates that there is even distribution of the relative number of sites in each landscape type over time; therefore, Aurignacian groups did inhabit riverine, coastal, hilly and mountainous areas from the time of their arrival in Europe. The only pattern in the landscape types occupied over time was the decrease in diversity at the end of the period of Aurignacian existence, which can be explained by the reduced sample size of Aurignacian sites after 29.5 Kyr BP, since sites in the landscapes occupied only rarely would be liable to disappear from small samples.

The dominance of riverine landscapes surrounding Aurignacian sites can be explained by the same factors as discussed for the Lower Palaeolithic results: the definition of a riverine landscape used in the study, high rates of preservation and dating of sites in river valleys (Bell and Boardman 1992), presence of critical resources such as large herds of fauna (Davies *et al.* 2003), or valleys forming natural corridors through unfamiliar territory (Kelly 2003). Regardless of the cause of the high levels of occupation of riverine landscapes, it appears that Aurignacian groups used these corridors through Europe as the route of their dispersal.

The landscapes occupied by Aurignacian groups are those that provide either a natural corridor through regions, or provide landmarks that allow easy navigation (Kelly 2003). Moreover, rivers and coasts are easily accessible, and therefore are anticipated to be among the first areas occupied. These areas are predicted to allow colonising groups to find resources and undergo group fission and fusion despite being unfamiliar with the area. This is supported by the presence of sites with large assemblage sizes in coastal, hilly or mountainous regions, which can be interpreted as representing large group sizes or long duration of occupation. Large groups implies that population was aggregated together at nodal points in the landscape, which provided known resources sufficient to support many people. Long duration of occupation likewise implies plentiful resources, but also suggests that these sites formed at points that could be relocated by individuals after foraging trips. However, the exclusively large size of sites in areas other than riverine conditions, shown in Figure 9.2, could be the result of sampling factors, because sites in these regions are rare, and the majority of all sites are large, thus small sites in rarely occupied conditions are not expected. Furthermore, hilly, mountainous or coastal conditions do not provide good preservation of archaeological material (Bell and Boardman 1992); therefore, it is possible that smaller sites in these conditions have been destroyed, leaving only the larger assemblages that have undergone some destruction but remain visible in the archaeological record.

The addition of possible and probable Aurignacian sites increases the number of occurrences in hilly and mountainous regions, particularly in the earlier periods. It is possible that some of these additional sites represent transitional industries, such as the Szeletian, which have been recovered in mountainous areas, and may be connected to the final Neanderthal population rather than modern human movements into Europe (Allsworth-Jones 1990). However, if these sites do represent anatomically modern human presence in these landscapes during the early phases of the movement into Europe, then hills and mountains did not present barriers to movement.

A route of spread of the Aurignacian along the river Danube and the Mediterranean coast has been suggested (Djindjian 1993; Kozlowski 1993; Conard and Bolus 2001). There is little evidence to support the Mediterranean coastal route, as coastal sites were found to be relatively late and extremely rare. However, the rises in sea level that occurred during the Late Pleistocene and early Holocene would have destroyed evidence of sites that had been located on the coastal plain, potentially accounting for the absence of evidence of coastal occupation. Therefore, at the current state of knowledge of the distribution of Aurignacian sites, it is impossible to rule out a coastal element to the movement, but the very high level of occupation of riverine areas from the earliest period of Aurignacian occurrence in Europe strongly supports colonisation through these corridors. However, the addition of the unlikely and probably Aurignacian sites boosts the number of coastal sites, possibly suggesting an atypical Aurignacian presence in coastal regions, perhaps related to the "proto-Aurignacian" industries (Arrizabalaga *et al.* 2003). Nevertheless, the majority of these additional coastal sites are dated to 36.5-33 Kyr BP, the time of the peak Aurignacian appearance, and therefore are unlikely to be connected to the processes of initial movement into Europe, again suggesting that a coastal route was not involved.

Plains and plateaux are more difficult to navigate through in the absence of detailed knowledge built over a considerable period of time, and therefore are expected to be occupied after other regions (Kelly 2003). The absence of Aurignacian sites from these landscapes could be explained by the lack of time between the arrival of modern humans and the demise of the Aurignacian for these difficult terrains to become familiar enough to be habitable. Moreover, the Aurignacian population may not have increased to a level where habitation of difficult landscapes was necessary due to population pressure before the end of the period of Aurignacian existence. Furthermore, if Aurignacian movement was focused through the river valleys, access to areas of high plateaux, plains and lakes may have been limited by the physical distance of these features from the valleys. The lack of Aurignacian sites in lacustrine surroundings is unexpected, given the high number of Lower Palaeolithic sites in such landscapes, but could be linked to a lower rate of natural occurrence of these features during OIS 3 than in the Early and Middle Pleistocene, related to the high levels of glacial remoulding of the landscape in the Middle Pleistocene glacials, especially in northwestern Europe during OIS 12. It is possible that Aurignacian groups did use plains, plateaux and lacustrine landscapes, but at a low intensity that is not detected in the archaeological record. For example, hunting trips on the plains may have created little archaeological residues, whereas major occupation bases in the river valleys would be more easily detected. Moreover, site preservation on the plains and plateaux is liable to be poorer than in riverine areas with continuous sedimentation that covers, protects and preserves sites (Waters 1992).

What environments were occupied by Aurignacian groups?

The Aurignacian environmental data.

The environmental data is limited by the small sample of sites for which a good description of the surrounding ecology was available, as it was possible to collect environmental data for only 38% of entries in the database. The lack of environmental information results in the findings of the ecological analysis remaining provisionary, as it cannot be assumed that the 38% sample is representative of Aurignacian environmental interactions. Nevertheless, some potentially interesting patterns in the types of environments occupied over time emerge from the data.

The null hypothesis of there being no relationship between the date of Aurignacian sites and the environment surrounding the sites was tested using chi-squared and lambda tests. This produced invalid chi-square test results, and values of lambda =0 (α=1.0) at all levels of certainty of Aurignacian presence. Therefore, there is no relationship between the dates of the sites and their environments. Figure 9.3 shows the number of definite Aurignacian sites in each environmental type during each date category. This demonstrates that temperate grassland/steppe is the most frequently occupied habitat, with temperate shrubland and woodland inhabited at moderate levels. The undiagnostic possible Aurignacian EUP sites are also found in taiga, whereas no definite Aurignacian sites were located in this biome. Temperate woodland and alpine grassland were only occupied before 29.5 Kyr BP.

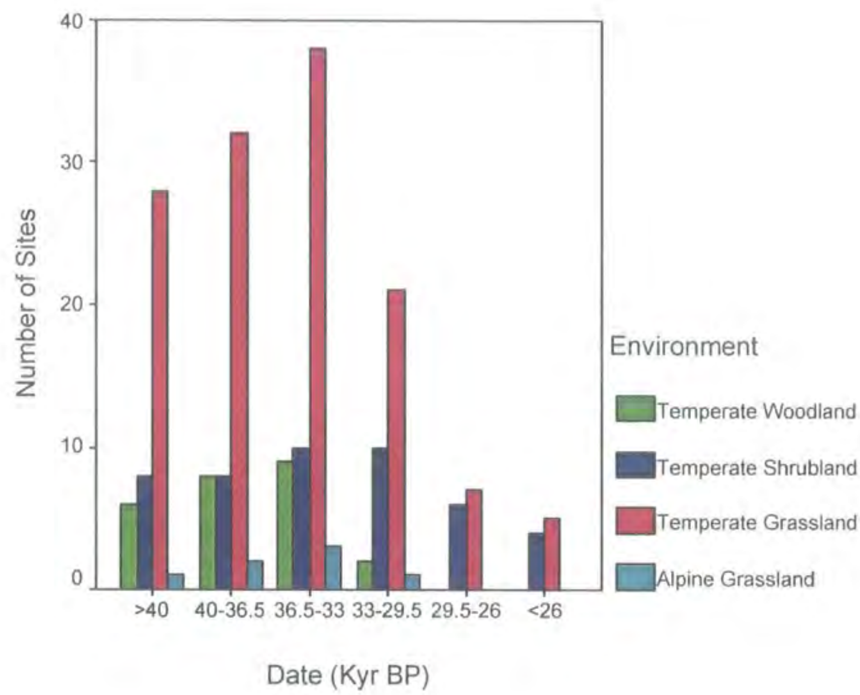

Figure 9.3. Chart showing the number of definite Aurignacian sites in each environmental type, during each date category. N=209.

The null hypothesis of there being no relationship between the environment of a site and the size of its assemblage was tested, with the aim of establishing whether any environmental type was more substantially occupied than the others. Chi-squared and lambda tests were applied to the null hypothesis that there is no relationship between the environment in which a site was situated and its assemblage size. The chi-squared tests produced invalid results, but lambda resulted in significant values at all levels of certainty of the assemblages being Aurignacian. However, all values of lambda were lower than 0.2, and therefore the relationship between assemblage size and environmental type is not strong. Figure 9.4 presents the number of definite Aurignacian sites in each environmental type and assemblage size category, for which lambda =0.125 (α=0.005). This shows that the largest sites tend to be found in temperate grassland/steppe, although some large sites are found in the other biomes. There are no small or very large sites in alpine grassland areas.

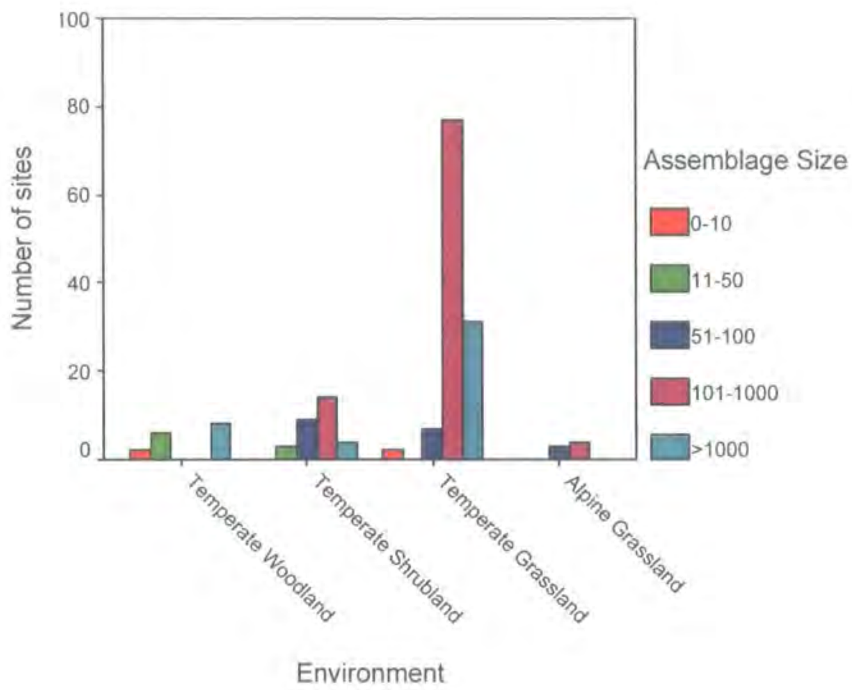

Figure 9.4. Chart showing the number of definite Aurignacian sites in each environmental type, divided by assemblage size. N=170.

The potential differences in the environment surrounding Aurignacian and faunal sites were investigated, with the aim of establishing whether the Aurignacian sites were located in a representative range of the environments in Europe during OIS 3, using the logic that the faunal sites should be located in a representative sample of European environments. Chi-squared and lambda tests were applied to the null hypothesis that there are no differences in the environment of the Aurignacian and faunal sites. The chi-squared tests were invalid, but lambda was strongly significant at all levels of certainty of Aurignacian presence, with a value =0.6 (α=0.013) for the definite Aurignacian sites, presented in Figure 9.5, which shows that the faunal sites only occurred in temperate woodland or tundra, whereas the Aurignacian was mainly in temperate grassland/steppe and temperate shrubland, with no occurrences in tundra.

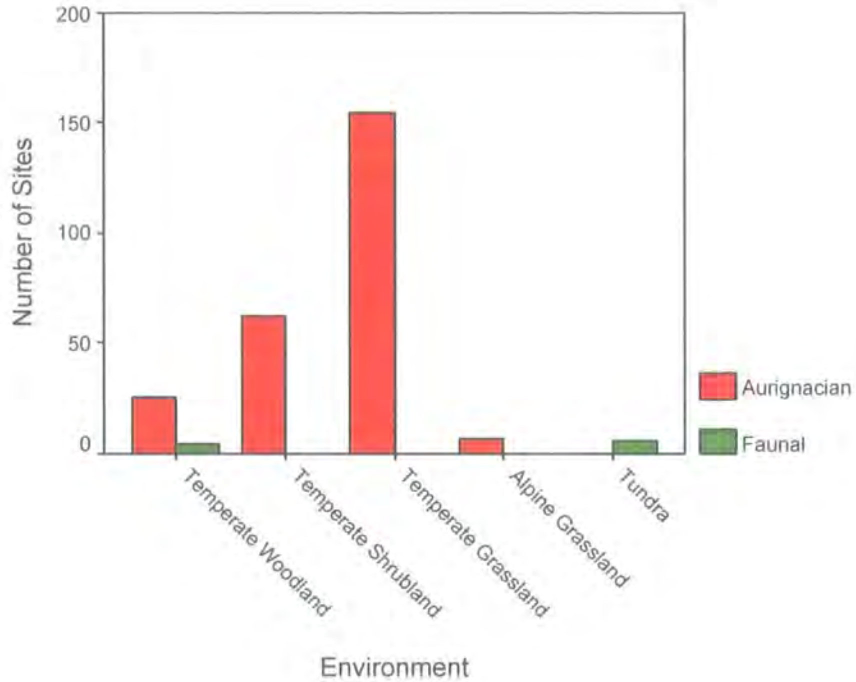

Figure 9.5. Chart showing the number of definite Aurignacian and faunal sites that occurred in each environmental type. N=260.

Environments occupied by the Aurignacian.

Sequence of occupation of the environmental types.

There is no significant relationship between the environments occupied by Aurignacian groups and time. The lack of a sequence of occupation of environments, shown in Figure 9.3, contradicts the environmental matching model of biogeography and Foley's archaeological model, which suggest that habitats most similar to those at the origin of the dispersers will be occupied at first, and other conditions will only be inhabited after adaptation. The greatest diversity of environments occupied appears at the beginning of the Aurignacian, and the range of biomes inhabited decreases as the number of Aurignacian sites falls. The presence of early Aurignacian sites in the full range of environments occupied implies that these habitats presented no adaptive problems for Aurignacian groups, the behaviours necessary to survive in these ecosystems were already possessed by the time of Aurignacian arrival in Europe, or were gained too rapidly for their development to be detected.

The absence of younger Aurignacian sites in the less frequently occupied ecosystems could be explained as a sampling factor, since young Aurignacian sites and presence in temperate woodland or alpine grassland are rare, it is unlikely that both conditions would be seen together. However, a genuine reduction in the range of environments occupied over time may have taken place as Aurignacian occurrences declined. A further possible explanation of the loss of Aurignacian presence in these biomes is that the environmental conditions in Europe changed towards the end of the Aurignacian, reducing the prevalence of these biomes. There is a trend towards a general climatic downturn from 44-37 Kyr BP, after which temperatures became as low as during the Late Glacial Maximum (van Andel 2003; Barron *et al.* 2003). Increasing cold would have made alpine grassland areas less habitable as harsher conditions would have occurred. A decrease in temperature could also have caused the contraction of temperate woodlands into refugia, leaving temperate shrublands and steppe as the prevalent conditions in the regions occupied by Aurignacian groups.

Habitat preferences.

Steppe is the most common environment in which Aurignacian sites were situated and contained the highest proportion of large sites, shown in Figure 9.4. This could be explained by steppic conditions being the most widespread habitat in Europe between 43.5-22.5 Kyr BP. Temperate grasslands and shrublands dominated the mid-latitudes of Europe in the regions of Aurignacian occupation during much of OIS 3, with temperate woodlands confined to the southernmost areas of Europe, particularly in the Balkans and Greece, as shown in Figure 9.6 (Huntley *et al.* 2003; Huntley and Allen 2003; Alfano *et al.* 2003). Alternatively, steppe could have been the preferred habitat of Aurignacian groups because it was familiar due to the origin of the Aurignacian being in a steppe environment. The Aurignacian is often explained as the signature of modern human groups moving into Europe from the Levant and ultimately from their origin in sub-Saharan Africa (Davies 2001; Mellars 1999); therefore, an origin in a steppic environment seems unlikely. However, as Aurignacian sites in the Levant are dated later than the material in Europe, an origin in Eurasia is possible. It is conceivable that modern humans moved north from the Levant with a generalised technology before developing the distinctive Aurignacian forms within Europe (Tostevin 2000), perhaps in the Balkans (Kozlowski 1992). This scenario would allow time for the adaptation to steppic conditions before the spread of the Aurignacian across Europe. Furthermore, grasslands are structurally similar in temperate and tropical conditions (Whittaker 1975), thus during the course of modern human evolution in Africa, and dispersal through the Levant, grasslands would have been encountered, and the European steppe would therefore be a relatively familiar habitat, requiring few changes in behaviour for survival. A further explanation that steppe was the most favourable environment for hunter-gatherers during OIS 3 in Europe is also plausible, as steppe habitats are likely to have contained large herds of herbivores (Guthrie 1990), allowing relatively good conditions for hunting. Forest environments have more dispersed faunal resources, which create problems for hunter-gatherer groups without high levels of technology designed to catch small arboreal mammals (Gamble 1995d; Roebroeks *et al.* 1992), and without the detailed knowledge of forest habitats required for survival in these biomes.

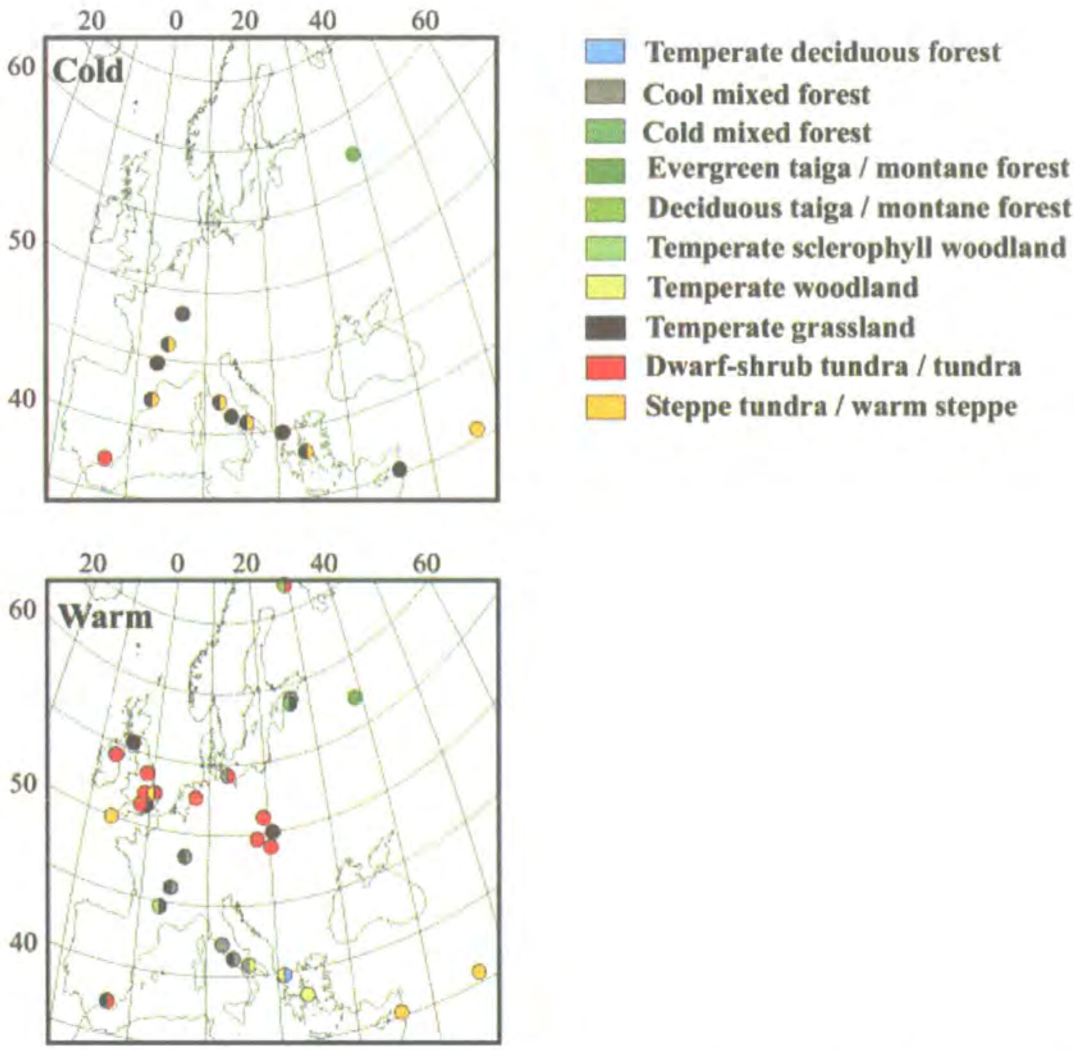

Figure 9.6. Maps of the OIS 3 cold and warm event pollen based biomes, inferred for each site in Europe with a continuous pollen sequence of the OIS 3 environment. (After Alfano *et. al.* 2003)

The presence of small numbers of Aurignacian sites in temperate woodland, and the absence of any definitely Aurignacian assemblages in forested conditions supports the contention that Aurignacian groups tended to avoid these habitats (Zilhão 2000), contra van Andel, Davies and Weninger (2003a), contradicting the suggestion that Aurignacian movement was facilitated by the spread of temperate woodlands during a warm climatic phase (Mellars 1996). The low levels of occupancy of wooded areas could also be explained by their naturally low prevalence across Europe during OIS 3 (Huntley *et al.* 2003; Huntley and Allen 2003). The sites located in temperate woodland habitats are all very small or very large, as shown in Figure 9.4. The initial stages of a movement are predicted by geographical and sociological models to involve clustering of population in known locations, which form destination nodes. Therefore, this patterning could potentially reflect the presence of major nodes and small outlying exploration or foraging sites, before the secondary dispersal of population into further areas as knowledge of the region increased. However, the small number of sites in temperate woodland conditions could explain the absence of medium sized assemblages simply as a sampling error.

The sites located in taiga conditions are limited to unlikely Aurignacian assemblages, which could be explained as an exploration of an unfamiliar or difficult habitat, or as the marker of the presence of non-Aurignacian and possibly Neanderthal groups. Exploratory groups could have used a restricted range of technology, due to high mobility, short duration of occupation of locations and small group sizes involved in exploration; therefore, the traces of exploratory groups may not contain distinctively Aurignacian material. However, these undiagnostic assemblages could also have been the product of EUP groups unrelated to the Aurignacian, possibly the final Neanderthal populations in Europe. This explanation is supported by these sites all falling within the older phases of the study period. The presence of Neanderthal groups in areas with different ecology to those inhabited by modern humans has been suggested as an explanation of the late survival of some Neanderthals, particularly in Iberia beyond the "Ebro Frontier" border between woodlands and more open environments (d'Errico *et al.* 1998; Zilhão 2000). Regardless of the explanation of the undiagnostic assemblages presence in taiga habitats, the absence of large scale Aurignacian settlement of forests remains a consistent feature.

Aurignacian groups also appear to have avoided extremely cold and open conditions. Figure 9.5 shows that faunal sites were located in areas of tundra, but Aurignacian sites were never recovered in these habitats. There are significant differences between the environmental types in which faunal assemblages were located and those of the Aurignacian. However, the faunal sample is extremely small compared to the archaeological sample, and the differences highlighted may not be a true representation of the environments avoided by Aurignacian groups. Nevertheless, this data does show that tundra conditions existed in Europe and that Aurignacian sites have never been recovered from tundra, which implies that avoidance of this biome did occur. It is possible that Aurignacian sites may have been destroyed in areas of tundra due to the glacial expansion that took place later in the Pleistocene. However, the presence in Russia of Palaeolithic sites within the Arctic Circle (Pavlov *et al.* 2001) suggests that preservation is possible, and the absence of the Aurignacian from tundra conditions reflects the actual environmental tolerances of these groups. Moreover, the presence of Gravettian assemblages in such cold conditions has been detected, supporting the deliberate avoidance of tundra by Aurignacian groups (van Andel *et al.* 2003a). However, tundra conditions seem to have been less widespread during the existence of the Aurignacian than the Gravettian, as the European climate became colder in the second half of OIS 3 (Huntley and Allen 2003). Furthermore, tundra was confined to areas to the north of the core region of occupation of the Aurignacian, and thus these conditions may simply not have been encountered due to their geographical distance from the centres of population.

OIS 3 faunal data.

The collection of the data concerning the faunal assemblages at archaeological and faunal sites during the time of existence of the Aurignacian produced a more complete sample than the faunal data in the Lower Palaeolithic database, although faunal remains had not been preserved at all sites. The Stage 3 Project database listed the species present at the faunal and archaeological sites; however, these data were found to be incomplete for some sites, and listed no fauna as present at some sites that did possess a faunal assemblage. The collection of the FADs, LADs and geographical origins of the OIS 3 fauna also proved easier than the Lower and Middle Pleistocene species, as the more recent species suffer fewer problems of unknown origins and phylogenies, and less taxonomic reassignments have affected the Late Pleistocene faunas. The problems of recording the proportion of species with an origin in each continent, and in each dietary type, at the Aurignacian sites were the same as those discussed for the Lower Palaeolithic faunal data.

The first appearance dates and last appearance dates of European fauna.

Investigation of the FADs of the genera recorded in the Upper Palaeolithic database revealed that no genera evolved in Europe during OIS 3, and none entered Europe from elsewhere during this period. Therefore, the movement of the Aurignacian is not associated with the appearance of any genera in Europe. There were also no recorded LADs of any genera during the timespan of the Aurignacian. Thus, there is no evidence of faunal turnover in Europe at the time of the Aurignacian movement.

The types of species present in Aurignacian sites.

Tests of the null hypothesis that there is no relationship between the proportion of carnivores at Aurignacian sites and time produced invalid chi-squared results, but lambda and Spearman's rank correlation were significant, with Spearman's rank correlation for fauna recovered from definite Aurignacian sites =-0.218 (α=0), thus there is a significant reduction in the proportion of carnivorous species recorded at Aurignacian sites over time. However, carnivores form a small proportion of the fauna at the vast majority of Aurignacian sites throughout the study period. The investigation of the proportion of omnivorous species at Aurignacian sites produced no significant values of lambda or Spearman's rank correlation at any level of certainty of Aurignacian presence; therefore, the proportion of omnivorous species recorded at Aurignacian sites does not change significantly over time, and the majority of sites contained less than 20% omnivores. The proportion of herbivorous species at Aurignacian sites was found to increase significantly over time, with a Spearman's rank correlation value =0.216 (α=0) at the definite Aurignacian sites, although herbivores dominate the assemblages throughout time.

The tests of the null hypothesis that the proportion of species that evolved in Africa at Aurignacian sites was not related to time produced insignificant values of lambda and invalid results for chi-squared, but significant values of Spearman's rank correlation test. The value = -0.131 (α=0.014) of Spearman's rank correlation of the proportion of

African fauna at definite Aurignacian sites shows that a weak but significant decrease in African species took place, although the level of African fauna was always below 30% of the species recorded. The proportion of species with an origin in the Americas did not produce significant values of lambda or Spearman's rank correlation when tested for changes over time, and therefore the level of American species in Aurignacian sites is independent of time, always remaining below 15% of the species present. The proportion of Asian species at Aurignacian sites likewise proved to be unrelated to time, as both lambda and Spearman's rank correlation tests produced no significant values when the null hypothesis that the proportion of Asian species at Aurignacian sites was not related to the date of the site was tested. The majority of Aurignacian sites contained between 5-10% of Asian species at all times. The tests of the proportion of indigenous fauna recorded at Aurignacian sites proved significant only when the undiagnostic EUP possible Aurignacian sites were included in the analysis, with lambda =0.031 (α=0.046) and Spearman's rank correlation =0.111 (α=0.014). Therefore, in all the possible Aurignacian sites, there is a very weak trend towards an increase in indigenous fauna over time, but in the probable and definite Aurignacian sites, there is no temporal patterning in the level of indigenous fauna. All Aurignacian sites contained at least 50% indigenous fauna, and the majority contained over 70%.

The genera present in Aurignacian and faunal sites.

Table 9.1 shows the number of occurrences of each genus in faunal sites during each date category, and Table 9.2 displays the genera occurring in definite Aurignacian sites. Comparison of the tables reveals that no genera in faunal sites are absent from Aurignacian sites. Chi-squared and lambda tests of the null hypothesis that there is no relationship between the presence of each genus in a site, and whether the site is Aurignacian or faunal provided no significant values, upholding the hypothesis. Chi-squared tests of the null hypothesis that there is no association between the genera and the presence of faunal or Aurignacian material produced insignificant results in all cases, upholding the null hypothesis. Thus, the genera in Europe in the early Upper Palaeolithic were present equally through time and at Aurignacian and faunal sites.

There are no statistical differences between the occurrence of genera in faunal compared to Aurignacian sites; however, there are differences in the most commonly occurring genera. Table 9.1 demonstrates that the most prevalent genera at faunal sites in rank order are: reindeer (Rangifer), bear (Ursus), hyena (Crocuta), horse (Equus), fox (Vulpes), wolf (Canis) and woolly rhino (Coelodonta). The most widespread genera at Aurignacian sites, seen in Table 9.2 are: Equus, auroch/bison (Bos/Bison), Ursus, Rangifer, red deer (Cervus), Canis and goat (Capra). Therefore, Equus, Bos/Bison, Cervus and Capra are over-represented in the number of Aurignacian sites in which they occur, compared to the expectations of the faunal sample, whereas Rangifer, Coelodonta, and Crocuta are under-represented.

	Date (Kyr BP)						
Genera	>40	40-36.5	36.5-33	33-29.5	29.5-26	<26	Total
Alopex	2	1		1	1		5
Bison	5	4	1	3	2	2	17
Bos						2	2
Bos/Bison	1				1	2	4
Canis	3	2	1	2	3	4	15
Capreolus						1	1
Cervus	1	1	1	2	1	2	8
Coelodonta	2	2	2	4	3	2	15
Crocuta	2	3	3	6	4	5	23
Equus	3	4	4	4	2	4	21
Gulo	2	2	1	1			6
Lynx						1	1
Mammuthus	2	1	1	2	1	2	9
Megaloceros	1	1	1	2	1		6
Meles	1	1	1	1		1	5
Mustela	1	1	1	1			4
Panthera	1	1				1	3
Rangifer	8	7	5	5	4	6	35
Rupicapra						1	1
Sus						1	1
Ursus	6	5	4	4	4	6	29
Vulpes	4	3	2	3	2	3	17

Table 9.1. The number of faunal sites containing each genus in each date category.

	Date (Kyr BP)						
Genera	>40	40-36.5	36.5-33	33-29.5	29.5-26	<26	Total
Alces	6	5	5	2	1		19
Alopex	18	26	28	12	2	1	87
Bison	10	16	19	12	4		61
Bos	15	19	25	17	9	3	88
Bos/Bison	22	31	35	26	19	11	144

Genera	Date (Kyr BP)						Total
	>40	40-36.5	36.5-33	33-29.5	29.5-26	<26	
Canidae	1	2	1	1			5
Canis	41	53	60	33	13	6	206
Capra	43	48	54	26	11	7	189
Capreolus	12	16	17	19	15	4	83
Cervus	41	51	63	45	23	9	232
Coelodonta	12	18	19	17	6	1	73
Crocuta	28	37	37	27	12	6	147
Cuon	1	2	2	1	1	2	9
Dama		1	1	1	1		4
Equus	71	88	107	82	42	16	406
Felis	13	12	5	3	2		35
Gulo	15	20	25	11	3	1	75
Lutra	1	1	1	1			4
Lynx	10	12	9	4	2		37
Mammuthus	21	29	33	21	7	1	112
Martes	8	9	8	4	1		30
Megaloceros	12	15	18	13	5	2	65
Meles	5	5	7	4	2		23
Mustela	21	25	28	14	10	1	99
Ovis				1	1		2
Palaeoloxodon	5	4	1	1	1		12
Panthera	28	34	35	17	5	2	121
Putorius	9	10	9	4	2		34
Rangifer	39	53	68	47	23	11	241
Rhinocerotidae	2	2	6	2	1	1	14
Rupicapra	32	37	37	28	16	3	153
Saiga	4	5	6	6	4	3	28
Stephanorhinus	6	6	3	2	2	2	21
Sus	18	18	21	20	12	5	94
Ursus	56	66	58	37	16	9	242
Vulpes	36	47	52	37	20	7	199

Table 9.2. The number of definite Aurignacian sites containing each genus in each date category.

The ecological context of Aurignacian movement.

Faunal turnover.

The timing of the FADs of the species present in Europe during the period of existence of the Aurignacian shows that no species appeared in Europe at the same time as *Homo sapiens*. Therefore, unlike the movements during the Lower Palaeolithic, there is no support for the spread of *Homo sapiens* into Europe forming part of a faunal dispersal event. Moreover, no LADs coincide with the appearance of the Aurignacian, although *Panthera pardus* (leopard), *Putorius putorius* (polecat), *Martes sp.* (marten), *Stephanorhinus kirchbergensis* (rhinoceros), *Palaeoloxodon antiquus* (straight-tusked elephant), *Dama dama* (fallow deer), and *Lutra lutra* (otter) all became less plentiful and eventually extinct as the environments of Europe deteriorated towards the Late Glacial Maximum, after the demise of the Aurignacian (Stewart *et al.* 2003a). This suggests that an element of faunal turnover was taking place in Europe at the time of arrival of the Aurignacian; however, the processes in operation had not resulted in the extinction of any of these species, and the opening of vacant niches when the Aurignacian appeared. Nevertheless, the decline of these species and the Neanderthal population may have provided opportunities for easier colonisation of Europe by *Homo sapiens*. Thus, the timing of the FADs and LADs does not support the idea of faunal turnover facilitating or causing the spread of *Homo sapiens*, but other more detailed studies of the population dynamics of the European Late Pleistocene fauna give weak support to these processes being related to Aurignacian movement.

Aurignacian interactions with the faunal community.

The results of the investigation into the proportion of recorded species at Aurignacian sites that were carnivorous, omnivorous and herbivorous show that carnivores decrease and herbivores increase, whilst omnivores remained a constant proportion over time. The lack of patterning in the omnivore presence at Aurignacian sites can probably be explained by the rarity of omnivorous species compared to carnivores and herbivores, which results in insufficient numbers of occurrences to produce significant relationships. The decreasing levels of carnivores and increasing herbivores over time could be interpreted as showing that the Aurignacian groups became better at obtaining herbivore prey species, avoiding and/or excluding carnivore competitors, and perhaps gained experience and knowledge of the European faunal communities, allowing the hunting of a broader range of herbivores. An alternative explanation is that the number of Aurignacian sites containing perforated teeth decrease over time, discussed in the following chapter (Figure 10.21, page 460) and as the species used for these ornaments tend to be carnivores, the decrease in personal ornamentation at the end of the Aurignacian could have driven the decrease in carnivore representation in the Aurignacian faunal assemblages. However, perforated teeth are rare artefacts, and thus may not account for the entire pattern.

Explanations of these patterns in terms of human behaviours seem more appropriate than changes in the natural prevalence of species over time in Europe, as the fauna in Upper Palaeolithic sites tends to reflect the subsistence and hunting choices of the people present, rather than being representative of the local faunal community (Musil 2003), supported by the differences in the prevalence of genera in faunal and Aurignacian sites revealed by the comparison between Table 9.1 and Table 9.2. The relatively high level of carnivore species seen in the earlier Aurignacian sites implies that these groups could survive high levels of competition, although the overall quantity of carnivores remained low throughout the Aurignacian. The problem of whether the number of species of each dietary type present at a site is a good measure of the composition of the faunal assemblages remains, and could undermine these findings. Nevertheless, as herbivores dominated the assemblages throughout time, variations in the number of carnivores present, even if these species were represented by few individuals, could be significant.

The proportions of species originating in each continent represented in the faunal assemblages of the Aurignacian sites show a decrease in African species, a possible increase in indigenous species and a constantly low level of Asian and American species. African species are always few in number and the decrease in their representation is weak, but the trend is significant. This raises the possibility that early Aurignacian groups were seeking out African species because they were more familiar than the other European fauna, since the modern human groups had presumably originated shortly before in Africa (Mellars 1996; Lahr and Foley 2003, 1998; Stringer 2002). However, as the Aurignacian groups entered Europe from the east, familiarity with Asian species would also be expected, which should be reflected in higher proportions of Asian species in the early Aurignacian sites. This prediction is not met, and since indigenous species always dominate the assemblages it appears that Aurignacian groups had the ability to obtain indigenous faunal resources from the time of their arrival in Europe. Therefore, there is little evidence of adaptation to the European faunal community, or of the source region of the Aurignacian groups, provided by the proportions of species in Aurignacian sites that originated in each continent.

An alternative explanation of the decrease in the proportion of African fauna in Aurignacian sites is that these species were naturally declining in abundance during the existence of the Aurignacian. However, among the species listed by Stewart *et al.* (2003a) as decreasing towards extinction during OIS 3 only *Panthera pardus* (leopard) had an origin in Africa, the rest are European or Eurasian, therefore faunal turnover cannot explain the decrease in African fauna in Aurignacian sites. Thus, the possibility remains that this pattern does reflect choices made by the Aurignacian groups. Nevertheless, as this pattern is based on the proportion of species recorded, rather than the proportion of individuals of each species, the findings must be treated with caution, as more detailed faunal data may refute these results.

The investigation into the genera present in faunal and Aurignacian sites revealed that there are no statistical differences between the two groups of fauna. However, there were far fewer faunal sites than archaeological sites, and therefore the genera missing from faunal sites that are present in Aurignacian assemblages may be explained by the small sample of faunal assemblages. These genera were: *Alces* (elk), *Capra* (goat), *Cuon* (dog), *Dama* (fallow deer), *Felis* (cat), *Lutra* (otter), *Martes* (marten), *Ovis* (sheep), *Palaeoloxodon* (elephant), *Putorius* (polecat), *Saiga* (saiga antelope) and *Stephanorhinus* (rhinoceros). The absence of these genera could be explained by the environmental differences between Aurignacian and faunal sites, which are significant as faunal sites are only found in tundra or temperate woodland, whereas Aurignacian sites are mostly located in steppe and temperate shrubland but never in tundra, as shown in Figure 9.5. The fact that there are no genera found at faunal sites that are not also present in Aurignacian sites suggests that the Aurignacian groups interacted with the full range of genera present in Europe. There is also a lack of temporal patterning to the genera in the Aurignacian assemblages, indicating that Aurignacian groups were able to exploit the full range of genera in Europe from the time of their appearance, and thus that the development of local knowledge of European fauna was not necessary.

There are differences in the rank order of the most widespread genera between the faunal and Aurignacian assemblages, which can be interpreted either as the Aurignacian groups seeking out certain fauna and avoiding others, or as a result of the strong environmental differences between the faunal and Aurignacian sites, shown in Figure 9.5. In comparison to the faunal sample, *Equus* is particularly widespread at Aurignacian sites, and *Rangifer* is under-represented. It is possible that the presence of *Equus* in the majority of Aurignacian sites relates to its high quality fats, which provide excellent weaning food, particularly for populations living in steppic environments (Levine 1998), and therefore that Aurignacian groups did deliberately seek out horses as a desirable food source, whether or not horses were readily available in the surrounding area. Horses have been widely found in Palaeolithic sites since the Plio-Pleistocene in Africa (Levine 1998), and may have been a more familiar prey species than *Rangifer*, to groups moving into Europe from the south. Moreover, as the majority of Aurignacian sites were in the steppe biome, whereas the majority of faunal sites were in tundra conditions, horses may have been more plentiful than reindeer in the regions occupied by the Aurignacian.

Crocuta is also under-represented at Aurignacian sites compared to faunal assemblages. It is possible that Aurignacian groups avoided hyenas either because these creatures were in competition with the humans, or because they created dangerous conditions. Additionally, the low levels of *Crocuta* in Aurignacian sites may explain the under-representation of *Rangifer*, if reindeer were a major prey species of the hyenas. The possibility that Aurignacian groups avoided dangerous competitors is reinforced by the lower than expected numbers of sites containing *Ursus*. However, the faunal sample may contain a large number of hyena dens, and other carnivore bone collectors' assemblages, explaining the high level of sites containing carnivores compared to the archaeological sites. Alternatively, carnivores may have avoided the Aurignacian groups in Europe because of the danger posed by human hunters to their competitors. Nonetheless, the overall rankings of the genera from faunal and Aurignacian sites suggest that environmental differences can account for most of the variance between the samples, as the faunal sites are dominated by species adapted to cold conditions, whereas the Aurignacian assemblages suggest a warmer environment. Nevertheless, as these results only reflect the number of sites in which genera were recovered, not the number of individuals in the site, it is possible that reindeer were the most numerous species at Aurignacian sites. Moreover, the faunal control sample for the EUP is very small and clearly biased in terms of environment, hence these interpretations remain provisionary.

Conclusions.

In conclusion, the data concerning the ecological circumstances surrounding the movement of Aurignacian groups across Europe provide no evidence of faunal turnover facilitating the spread, in contrast to the findings of the Lower Palaeolithic ecological analysis. Furthermore, the landscape and environmental data show the greatest diversity of habitats were occupied in the earlier periods of the Aurignacian, again producing the opposite pattern to that of the Lower Palaeolithic. These findings suggest that Aurignacian movement was relatively independent of the ecological context in which it occurred, and that most of the physical environmental conditions of Europe either created no difficulties for the Aurignacian groups, or that adaptation to overcome constraints was too rapid to be detected. However, the absence of Aurignacian sites in extremely cold and open environments, and in plains and high plateaux could indicate that these conditions were beyond the tolerance limits of the earliest *Homo sapiens* groups in Europe. Nevertheless, the lack of a sequence of landscapes and environments inhabited by Aurignacian groups, and the lack of ecological facilitators of movement indicates that the behaviours surrounding Aurignacian movement could be more important in the process that occurred than these ecological and physical environmental factors. The following chapter will attempt to address the behavioural context of the Aurignacian movement, with the aim of determining whether the behavioural processes involved can be identified.

Chapter 10 : Behaviours associated with movement during the Aurignacian.

This chapter will address the questions of whether it is possible to detect the behaviours associated with the movement of the Aurignacian, and whether an exploratory phase preceded the major movement of *Homo sapiens* groups into Europe. The issue of exploration will be investigated through the assemblage size and distribution data, and the movements of raw materials, the numbers of fauna utilised, the numbers of hearths in each site, and the presence or absence of structures. Behavioural changes during and following the occupation of Europe will be explored through the evidence of the types of artefacts present in assemblages temporally and spatially. This chapter presents the equivalent data to that of Chapter 7, with the addition of the numbers of hearths and presence of structures, allowing comparison to the events of the Lower Palaeolithic. Exploration will be addressed initially, followed by the question of behavioural change.

Did Aurignacian groups explore Europe before settlement?

The proxy indicators of the presence of a pioneering stage before major settlement all suffer from problems of a lack of published evidence. Assemblage size data were only available in the published records of 48% of the entries in the database. Raw material transfer distances were published for 20% of the sites and utilised species were known in 30% of the assemblages. The presence or absence of structures was recorded in publications of 33% of the sites. The only proxy of exploration that was extensively available was the number of hearths present in each site context, which was recorded for nearly all the entries in the database, but the vast majority of these sites had no hearths. Therefore, all the proxy indicators of the presence of ephemeral exploration preceding major settlement can be questioned due to their poor publication and resulting small and possibly unrepresentative sample sizes.

What size population was involved in the Aurignacian movement into Europe?

The size of the assemblages was used as a possible proxy for the size of the population. The null hypothesis that there is no relationship between the date of an Aurignacian site and the size of its assemblage was investigated using tau-C and Spearman's rank correlation tests, with the assemblage size categories of: 0-5, 6-10, 21-50, 51-100, 101-500, 501-1000, 1001-5000, and >5000. The tests were then repeated using the categories of 0-10, 11-50, 51-100, 101-1000, and >1000 artefacts. Significant results were produced using the nine categories of assemblage size for the definite Aurignacian data, for both tau-C and Spearman's rank correlation tests, but not when the probable and possible Aurignacian undiagnostic EUP sites were added. Figure 10.1 illustrates the number of definite Aurignacian sites with each size of assemblage in each date category, which has the significant relationship between these variables, demonstrating that moderately large assemblages are always the most common. The significant values of tau-c =-0.101 (α=0.042) and Spearman's rank correlation =-0.130 (α=0.041), reveal that there is a negative relationship between assemblage sizes and time. Figure 10.1 shows that the decrease in large sites over time is concentrated in the largest sites, with assemblages of more than 1000 artefacts. Therefore, there is a weak trend for the size of definitely Aurignacian sites to decrease over time. The tests using five categories of assemblage sizes provided insignificant negative values for both test statistics.

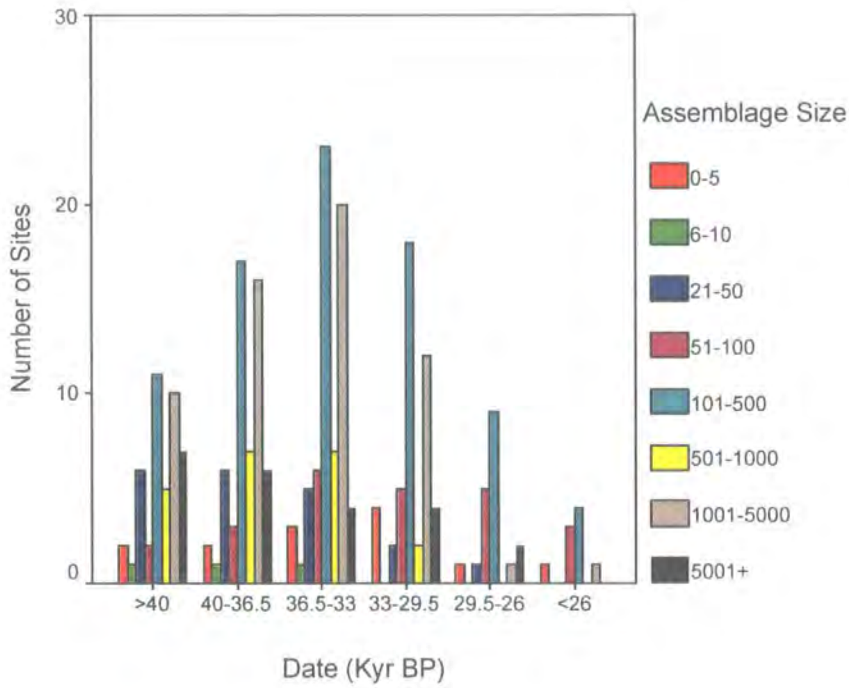

Figure 10.1. Chart showing the number of definite Aurignacian sites with an assemblage size in each category, during each date category. N=246.

The relationship between assemblage size and exploration in the Aurignacian.

The investigation into the assemblage sizes showed that there is a weak trend for the size of definite Aurignacian assemblages to decrease over time, which disappears as the less certainly identified material is added to the analysis. Therefore, there is no early phase of small assemblages as predicted to occur during exploration, contrary to the expectations of Davies (2001). The decrease of assemblage sizes over time could be interpreted as greater dispersal of Aurignacian groups across the regions occupied later in time, reflecting increased familiarity with the local conditions after settlement of Europe, which caused secondary dispersal and the breakdown of major population nodes. Thus, the assemblage size data would be detecting the major establishment of the second phase and secondary dispersal of the third phase of movement. However, the trend seen in decreasing site size is very weak, providing only slight support for the notion of an increasingly dispersed population in small groups. Moreover, the decreased site size could also be attributed to the decline in the volume of

Aurignacian material towards the end of the existence of this techno-complex. The decreasing size of definite Aurignacian assemblages over time could be related to an improvement in the identification of the Aurignacian, perhaps as a result of a greater number of diagnostic tools being produced. However, the trends in the occurrence of tool forms over time, discussed below, show that the Aurignacian forms match the overall prevalence of Aurignacian sites in time; therefore, sites did not become more distinctly Aurignacian, and the problem of identifying assemblages does not interfere with the site size data over time in this manner.

The lack of a trend in assemblage sizes when the undiagnostic assemblages are included in the analysis could be taken to show that these assemblages are not related to the Aurignacian, and their addition destroys genuine patterning. However, as the generic EUP assemblages tend to be small, their inclusion increases the number of small sites, particularly at the beginning of the period of Aurignacian existence. These assemblages could represent the pioneering groups and lack Aurignacian "type fossils" due to the restricted assemblage size, the limited range of tool forms used by small and highly mobile groups (Davies 2001), or the movement of these groups across Europe before the development of the distinctively Aurignacian features. The lack of a trend in assemblage size would then be explained by small sites occurring at the beginning, and a reduction in large sites at the end of the existence of the Aurignacian, producing no overall trends in site size. This patterning is the opposite of that seen in the Lower Palaeolithic assemblage sizes because there is not a problem of identifying humanly manufactured assemblages during OIS 3; the limitation in the data involves the placement of the assemblages into techno-complexes.

How were the Aurignacian groups distributed across Europe?

Figures 10.2-10.13 display the spatial distribution of the Aurignacian sites during each of the six date categories, with the points of the maps scaled to the size of the assemblage present at each site. The assemblage size categories used are 0, 1-10, 11-50, 51-100, 101-1000, and >1000. The sites with assemblage sizes of zero either contained *Homo sapiens* fossils unaccompanied by an archaeological assemblage, or were archaeological sites for which assemblage size data was not available. The maps show the definite and probable Aurignacian sites during each period, providing a comparison between the two classes of data. The sites deemed unlikely to be Aurignacian are not included as they produced an extremely similar pattern to the probable Aurignacian sites.

Figure 10.2 presents the spatial distribution of the definite Aurignacian sites, which reveals that there were no areas of pre-40 Kyr BP Aurignacian occupation that exclusively contained small sites. Large sites are clustered in southwestern France, Central Europe and Bulgaria. Comparison with Figure 10.3, which illustrates the probable Aurignacian sites, shows that the addition of the less certainly Aurignacian sample includes smaller assemblages, particularly in Britain and Central Europe.

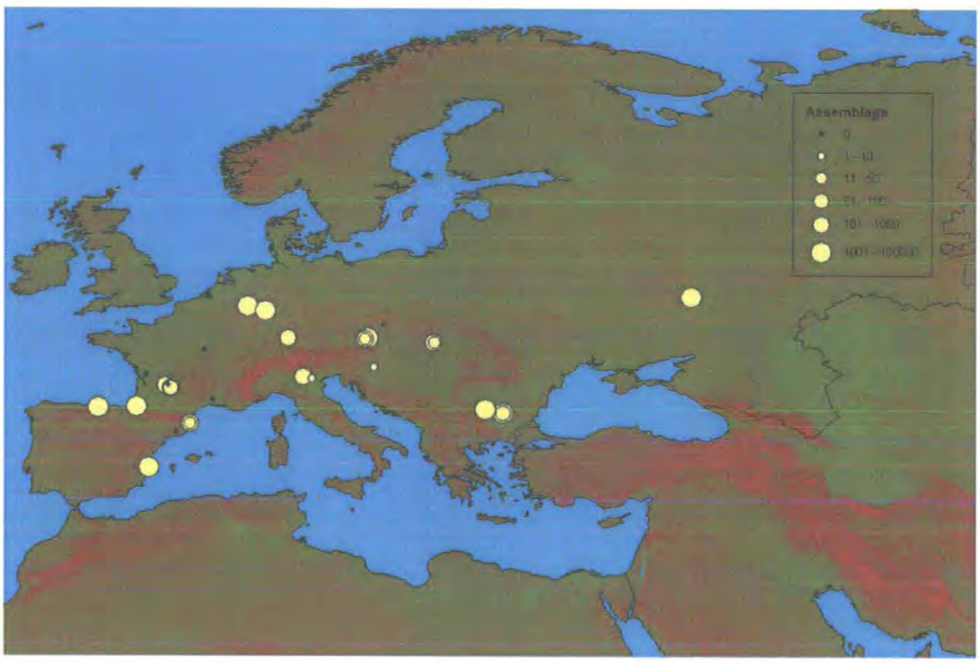

Figure 10.2. Map showing the definite Aurignacian sites older than 40 Kyr BP, displaying the assemblage size of the sites.

Figure 10.3. Map showing the probable and definite Aurignacian sites older than 40 Kyr BP, displaying the assemblage size of the sites.

Figure 10.4 and Figure 10.5 present the assemblage sizes found across Europe at definite and probable Aurignacian sites between 40-36.5 Kyr BP. These demonstrate that occupation was focused on the same areas as earlier, but was denser. The cluster in southwestern France extended into northern Spain. The addition of the less certainly Aurignacian sites again included more small sites.

Figure 10.4. Map showing the definite Aurignacian sites dated between 40-36.5 Kyr BP, displaying the assemblage size of the sites.

Figure 10.5. Map showing the probable and definite Aurignacian sites dated between 40-36.5 Kyr BP, displaying the assemblage size of the sites.

Figure 10.6 and Figure 10.7 cover 36.5-33 Kyr BP, the period with the most Aurignacian sites. These maps reveal a further build up of large sites in the core areas of southwestern France, Central Europe and Bulgaria. Large sites are located in clusters in northwestern Europe, and a spread into northeastern Europe took place. This period also sees an increase in smaller definite Aurignacian sites. Figure 10.7 demonstrates that the undiagnostic EUP assemblages are found in the areas peripheral to the Aurignacian core of occupation, such as Britain and southern Iberia, and these sites tend to contain smaller assemblages than the definite Aurignacian sample.

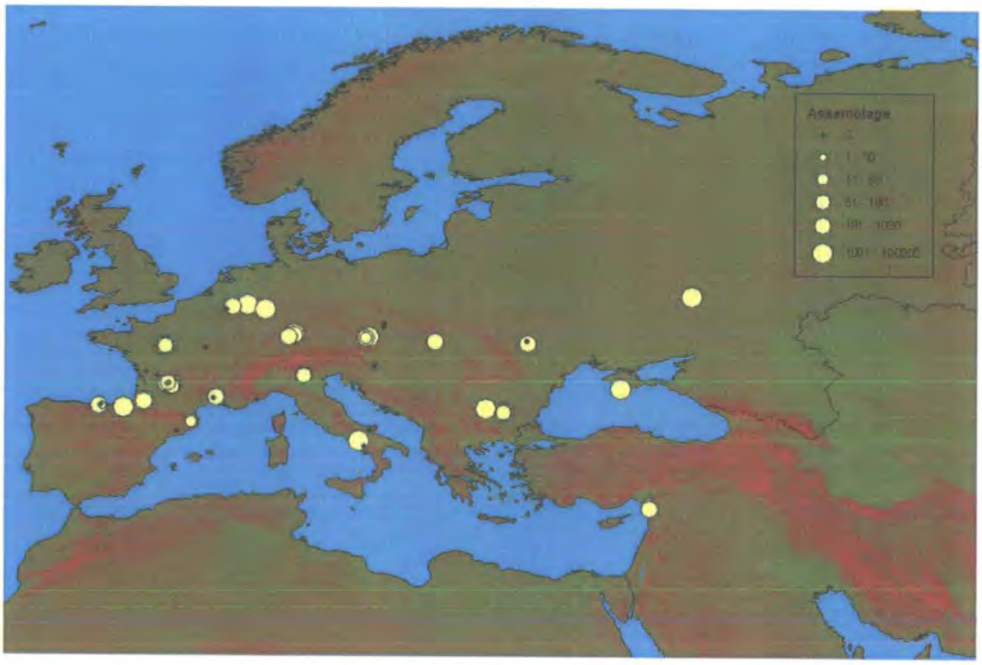

Figure 10.6. Map showing the definite Aurignacian sites dated between 36.5-33 Kyr BP, displaying the assemblage size of the sites.

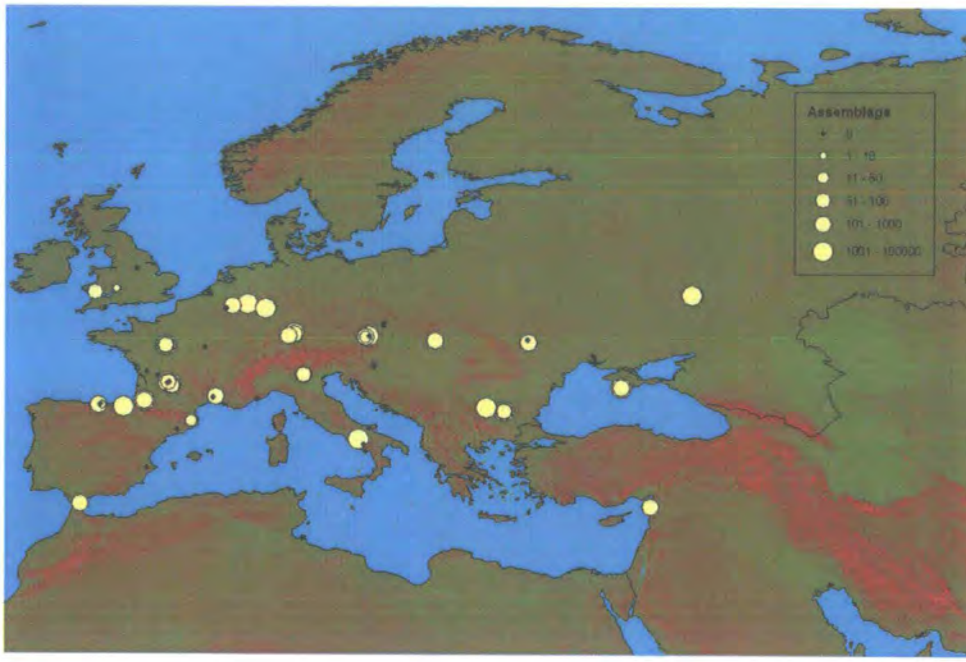

Figure 10.7. Map showing the probable and definite Aurignacian sites dated between 36.5-33 Kyr BP, displaying the assemblage size of the sites.

Figure 10.8 and Figure 10.9 display the distribution of assemblage sizes in Europe during the period between 33-29.5 Kyr BP, which continue to demonstrate substantial occupation in the core areas of southwestern France, Central Europe and southeastern Europe, but a cluster of large sites is also seen in Russia. Figure 10.9 shows that the less certainly Aurignacian sites are located in the periphery of occupation, in Iberia and Britain, and remain smaller than the definite Aurignacian assemblages.

Figure 10.8. Map showing the definite Aurignacian sites dated between 33-29.5 Kyr BP, displaying the assemblage size of the sites.

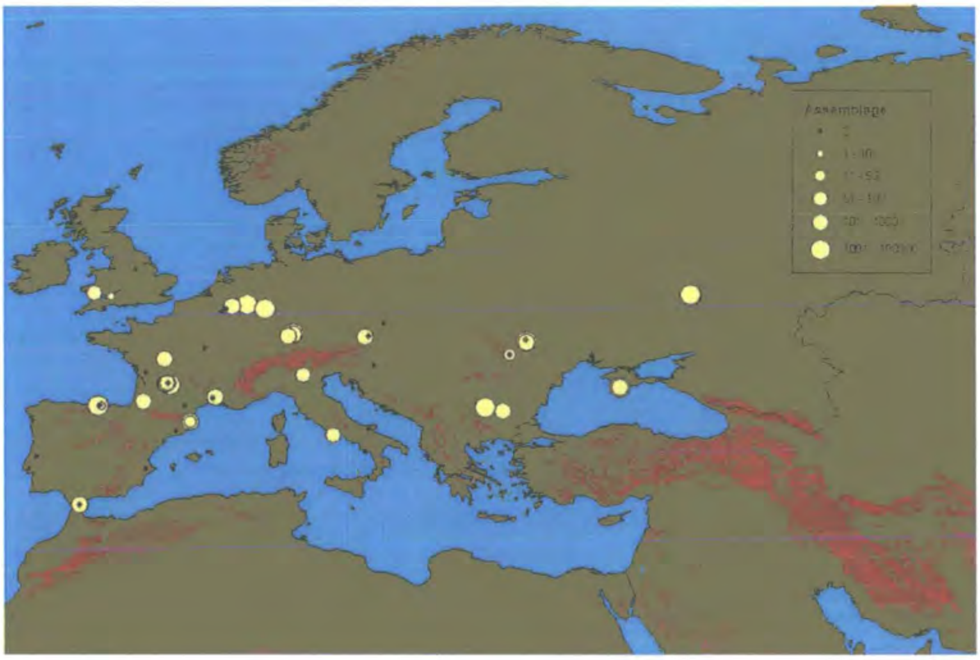

Figure 10.9. Map showing the probable and definite Aurignacian sites dated between 33-29.5 Kyr BP, displaying the assemblage size of the sites.

Figure 10.10 and Figure 10.11 illustrate the Aurignacian sites dated between 29.5-26 Kyr BP, towards the end of the Aurignacian. These maps reveal that no large definite

Aurignacian sites were located between Austria and Russia. The less certainly Aurignacian assemblages also show a lessened presence in Eastern Europe compared to earlier periods, but some large sites are located in this region.

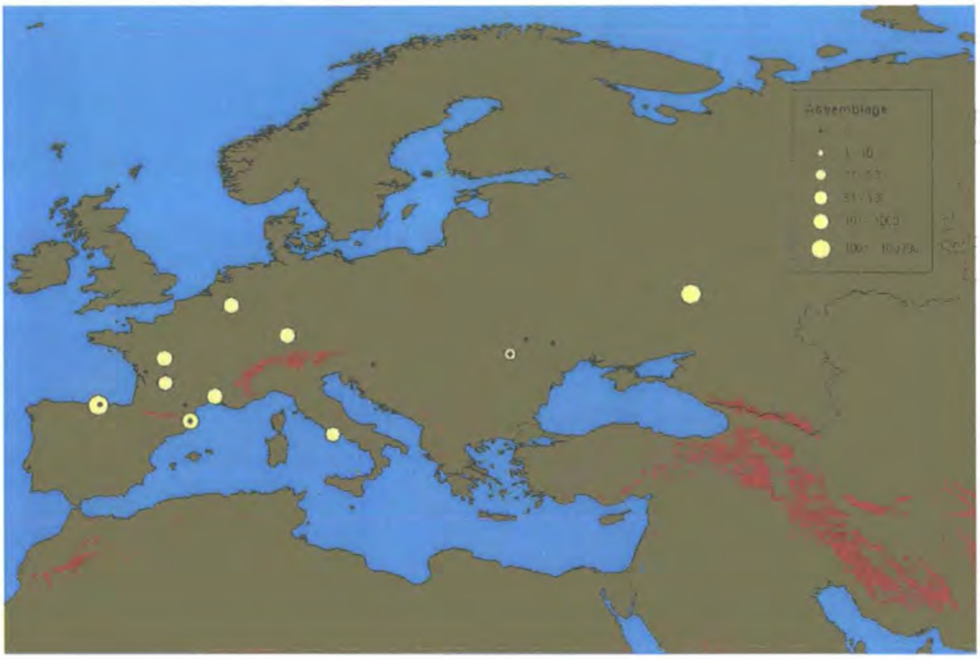

Figure 10.10. Map showing the definite Aurignacian sites dated between 29.5-26 Kyr BP, displaying the assemblage size of the sites.

Figure 10.11. Map showing the probable and definite Aurignacian sites dated between 29.5-26 Kyr BP, displaying the assemblage size of the sites.

Figure 10.12 and Figure 10.13 reveal the extent of the spatial contraction in the last phase of the Aurignacian, after 26 Kyr BP. Definite Aurignacian sites became restricted to France and Northeast Europe, and probable Aurignacian sites only added limited presence in Britain, Spain and the Czech Republic. The only cluster of large sites remaining is in southwestern France, the other sites are all isolated.

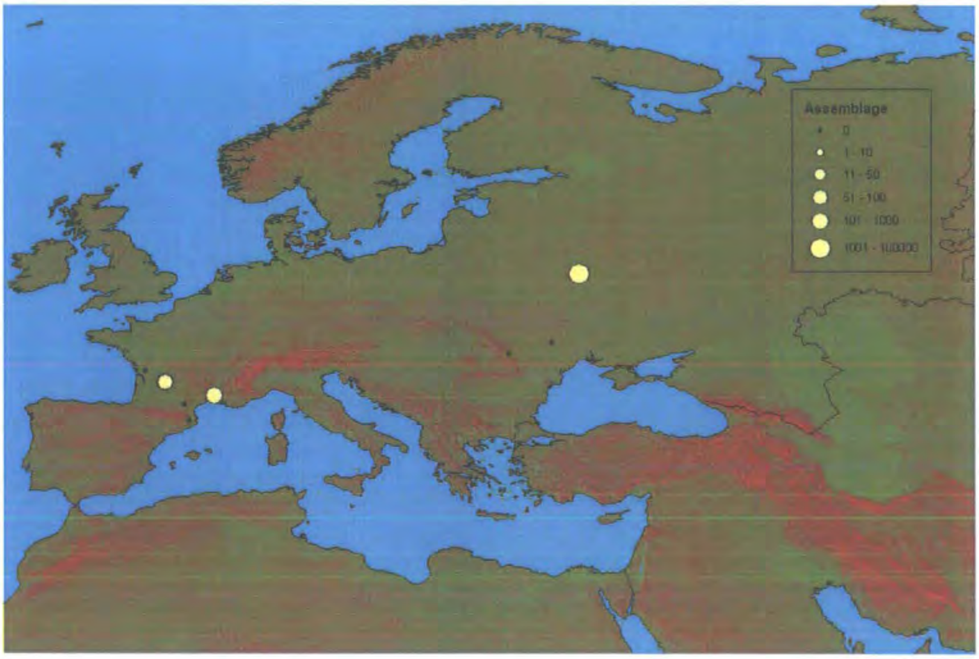

Figure 10.12. Map showing the definite Aurignacian sites dated after 26 Kyr BP, displaying the assemblage size of the sites.

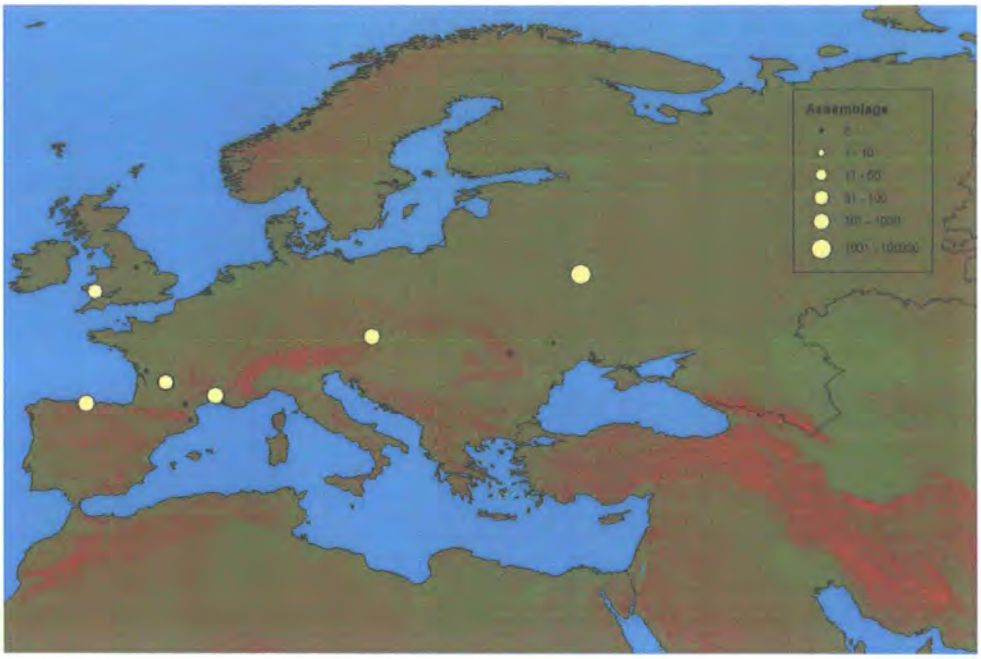

Figure 10.13. Map showing the probable and definite Aurignacian sites dated after 26 Kyr BP, displaying the assemblage size of the sites.

The relationship between the spatial patterning of the assemblage sizes and exploration in the Aurignacian.

Throughout the time of Aurignacian occurrence, clusters of sites can be seen in restricted geographical areas. The presence of clusters in the earliest phase of occupation denies the possibility of detecting a purely exploratory phase of colonisation, in which group size was limited, duration of occupation of sites was brief and the population was widespread at low density (Davies 2001). Large sites are located in the core areas of occupation in Central and Western Europe from the earliest phase, which could be interpreted as forming nodes in locations with favourable resources (Davies *et al.* 2003). Nodes are also predicted to form at points which can easily be relocated, particularly on natural routes through a landscape, such as in river valleys, and where resources are known to occur, reducing the risks of survival when regions are unfamiliar (Kelly 2003). Moreover, population nodes are predicted to form by geographical and sociological models of human movements, as a result of knowledge of the region being restricted among incoming groups, which focuses movement towards known locations identified by initial exploration (Tilly

1978; Anthony 1997). Alternatively, the clusters of sites could represent regional centres of dispersal beyond the core zone of population, from which further movement took place (Bocquet-Appel and Demars 2000), as suggested in some ecological biogeographical models (Shigesada and Kawasaki 1997). The clustering of Aurignacian sites into nodes could be the result of any or all of these four processes, and the site location data alone cannot determine which was in operation. The clusters of sites get larger and settlement is consolidated within the core areas of occupation between 40-33 Kyrs BP. This expansion in site size and number within the core could be the result of population increase among the original Aurignacian migrants, or could be caused by ongoing movements into Europe.

Potential evidence of the secondary dispersal into smaller nodes, predicted by the chain migration model (Tilly 1978), is seen in Figure 10.6 and Figure 10.7, the maps of 36.5-33 Kyr BP, which show an increase in medium sized sites within the core area of occupation. However, this patterning could also be explained by the sample size of sites during this period, as small-medium sized assemblages are relatively rare and therefore are expected to be associated with the period in which most Aurignacian sites occur.

Clusters of large sites are found throughout the core area of occupation, as well as throughout the duration of existence of the Aurignacian. In the peripheral areas smaller and less diagnostic assemblages have been recovered, without spatial clustering, particularly in Britain, throughout the study period. These sites could be interpreted as representing exploration beyond the borders of the core area of occupation by smaller groups, producing a restricted range of tool forms that did not include the distinctive Aurignacian types, as predicted by chain migration models. Alternatively, the peripheral regions may have been exploited on a seasonal or infrequent basis by foraging groups, without permanent settlement following, fitting the circular migration model of sociology and geography (Tilly 1978). A further possibility is that these sites were not created by modern human groups moving across Europe, but represent the final Neanderthal populations making use of a limited EUP technology.

How far were Aurignacian groups transporting raw materials?

The null hypothesis of there being no relationship between the date of a site and the maximum distance that materials were transported to the site were examined using tau-C and Spearman's rank correlation tests, neither of which produced any significant values for any of the levels of certainty of Aurignacian presence. Therefore, there is no significant relationship between maximum raw material transfer distance and time. Figure 10.14 displays the maximum raw material transfer distances for the definite Aurignacian sites in each date category. This demonstrates that all sites contained materials transferred at least 10 Km, and a substantial number of sites contained materials transported over 100 Km.

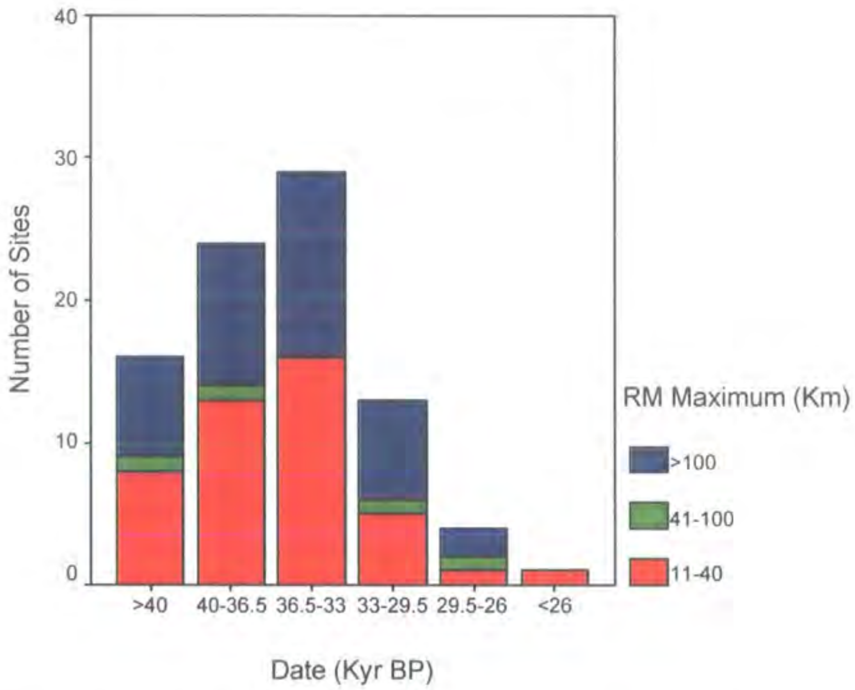

Figure 10.14. Chart showing the number of definite Aurignacian sites with maximum raw material transfer distances, in each date category. N=87.

Testing the null hypothesis that there is no relationship between the minimum raw material transfer distance and date of a site provided no significant values of tau-C or Spearman's rank correlation tests. All sites contained materials transported a minimum of between 0-5 Km in all periods. Therefore, the null hypothesis is upheld, and there is no link between minimum transportation distances and the dates of Aurignacian sites.

The relationship between raw material transfers and exploration in the Aurignacian.

The transfers of raw materials show no trends in the distance of maximum or minimum transportation over time at any level of certainty of attribution to the Aurignacian. This lack of a trend could be the result of Aurignacian groups failing to gain knowledge about their surroundings and the distribution of resources regionally across Europe. However, it seems unlikely that over a period of more than 10000 years that no additional experience and expertise would be built up among the resident groups. Therefore, the lack of a trend in raw material transfers could be indicating that the time averaging as a result of the broad ranges of radiocarbon dates at this time depth destroys potential patterning related to movement processes. Alternatively, Aurignacian groups may have gained knowledge of their surroundings rapidly, hence from the earliest periods of Aurignacian existence in Europe these groups would have been able to locate raw material sources. Additionally, the lack of a trend in transportation distances could be interpreted as reflecting a constant size of home ranges and social networks among Aurignacian groups. However, the exploratory phase may have involved very rapid movement of small groups before the appearance of the Aurignacian, which has not been detected in the archaeological record, or has not been distinguished from the preceding Middle Palaeolithic industries. Moreover, given the very low numbers of sites for which transportation data was available, any interpretation of this lack of a pattern must remain provisional. Long distance transfers of raw materials are a constant aspect of the Aurignacian assemblages, providing no support for Davies (2001) claim that pioneer phase sites should only contain local raw materials.

How many faunal species did Aurignacian groups utilise?

The potential patterning in the number of species used by Aurignacian groups was investigated using the null hypothesis that the number of utilised species at a site is not related to the date of the site. The results of tau-C and Spearman's rank correlation tests of this hypothesis provided no significant values at any level of certainty of Aurignacian presence. Therefore, the number of species with evidence of utilisation at an Aurignacian site is unconnected to the date of the site. Figure 10.15 shows that definitely Aurignacian sites contained between 0-9 utilised species, and that the modal quantity was between 2-4 throughout the existence of the Aurignacian.

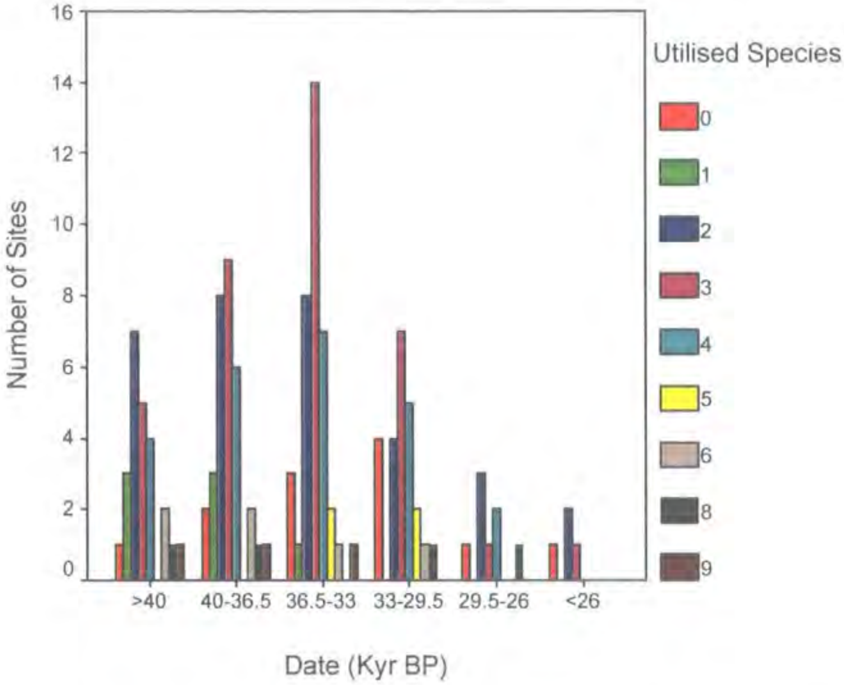

Figure 10.15. Chart showing the number of definite Aurignacian sites in each date category, divided by the number of species utilised at the site. N=129.

The relationship between faunal utilisation level and exploration during the Aurignacian.

The investigation into the number of species utilised in each site revealed that there are no trends over time, but a broad range of species were used by Aurignacian groups throughout the time of existence of the Aurignacian. This suggests that it was not necessary to gain local knowledge before being able to exploit the species encountered across Europe, and that specialisation and diversification were not undertaken during the Aurignacian, although the use of species recorded as showing signs of utilisation, rather than the number of individuals of each species may be masking narrowing or broadening of resource use. However, the knowledge necessary to exploit local faunal resources may have been gained rapidly, resulting in full utilisation of local resources from the very beginning of the Aurignacian. Although species differ between Europe, Asia and Africa, the general similarities in behaviours of prey species could allow rapid adaptation to the European communities. Alternatively, the time averaging produced by the large standard deviations of radiocarbon dates at this age has destroyed the possibility of identifying trends in the interaction of Aurignacian groups with the fauna over time. Moreover, the broad range of species used by Aurignacian groups could indicate a foraging strategy based on expedient use of any resources encountered (Davies 2001), rather than a system requiring knowledge and planning.

How many hearths were present in Aurignacian sites?

The potential connection between the number of hearths found in Aurignacian sites and the dating of sites was investigated using the null hypothesis that there is no relationship between the date of a site and the number of hearths it contains. The results of the tau-C and Spearman's rank correlation tests of this hypothesis, using all numbers of hearths, show significant results when the data includes all possible Aurignacian sites, but reveals no significant patterning when undiagnostic EUP sites are removed from the analysis. The values of the test statistics are all very low, with a maximum value = -0.092 ($\alpha=0.03$) for the Spearman's rank correlation of probable and definite Aurignacian sites; hence, this relationship is very weak but shows a decline in the number of hearths at each site over time. However, when the sites containing no hearths were removed from the investigation the opposite patterning was found, with a significant relationship between the number of hearths and time only occurring in the definite Aurignacian sample. This relationship was also stronger, with a tau-C value $=0.129$ ($\alpha=0.023$), and Spearman's rank correlation $=0.182$ ($\alpha=0.03$), suggesting that sites with large numbers of hearths tend to be younger than those with few hearths, as shown in Figure 10.16.

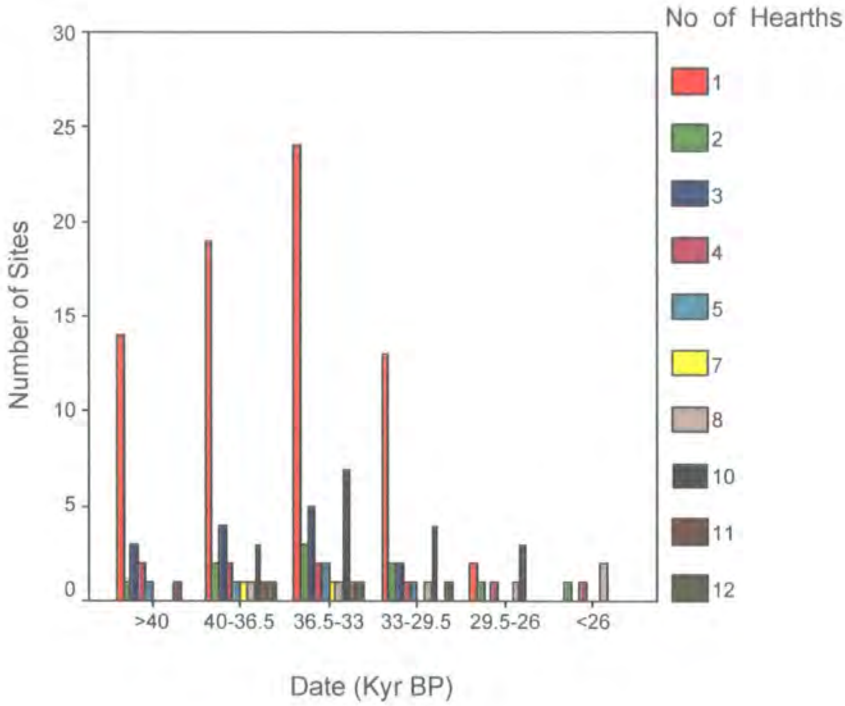

Figure 10.16. Chart showing the number of definite Aurignacian sites in each date category, divided by the number of hearths at each site. N=141.

The relationship between the numbers of hearths at Aurignacian sites and exploration.

The trends detected in the number of hearths at sites over time, including the sites that contained no hearths and the uncertainly Aurignacian sites, were towards a reduction. However, no patterning was found when the analysis excluded the uncertainly Aurignacian assemblages. The lack of patterning in the definite Aurignacian sample could be accounted for by the decreased sample size; however, as the number of hearths was the most widely available proxy for exploration, it seems unlikely that this factor would suffer from sample size problems. Nevertheless, as the trend is extremely weak it could be destroyed by reducing the sample analysed. The analysis excluding sites with no hearths revealed a stronger and positive trend in the definite Aurignacian sample, and no relationship with time in the more inclusive sample. This analysis is more valid as the sites without hearths may have genuinely lacked such features, but may also have contained hearths that either were not recorded in the published record, or have been destroyed by taphonomic processes (Karkanas *et al.*

2000). Therefore, there seems to be a trend towards an increasing number of hearths in Aurignacian sites over time, which can be interpreted as reflecting an increase in group sizes or an increase in the duration of occupation of sites. Although the data concerning the number of hearths cannot be used to determine which of these explanations applies, both of these factors are associated with the established settlement phase of a movement, suggesting that the number of hearths does reflect colonisation processes.

How many Aurignacian sites contained structures?

The null hypothesis that there is no relationship between the presence of structures at an Aurignacian site and its date was examined using chi-squared and lambda tests, which produced invalid results of chi-squared, and values of lambda =0 (α=1.0) at all levels of confidence of the presence of the Aurignacian assemblages, upholding the null hypothesis. Figure 10.17 shows the definite Aurignacian sites in each date category, divided by presence or absence of structures, and demonstrates that there is no period with a greater proportion of sites with structures than any other.

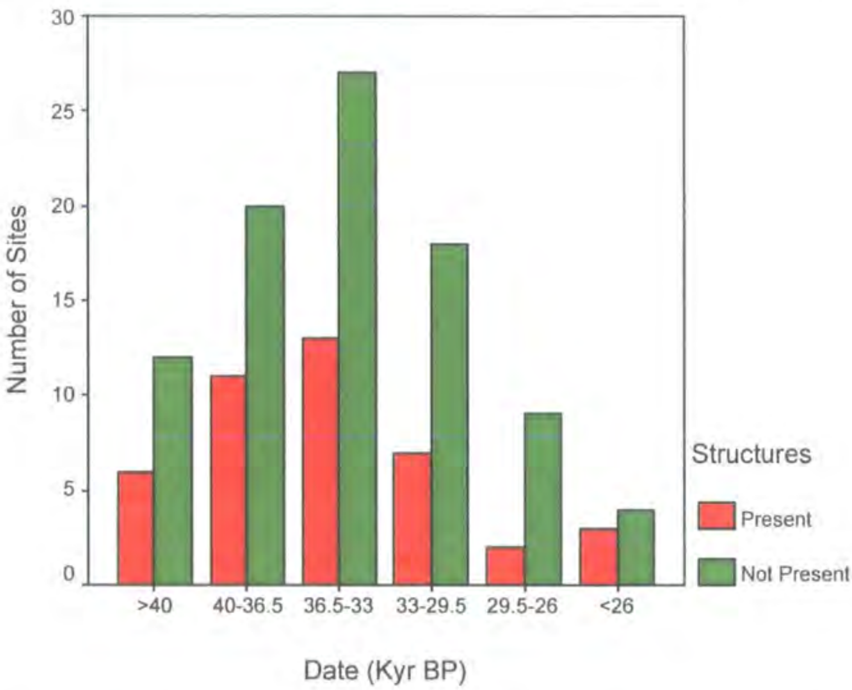

Figure 10.17. Chart showing the number of definite Aurignacian sites in each date category with or without structures. N=132.

The relationship between the presence of structures and exploration in the Aurignacian.

No trends were detected in the proportion of sites with structures over time, throughout the study period roughly a third of sites contained structures. The lack of a trend in the presence of structures can be seen as evidence for a consistent level of both foraging and residential mobility among Aurignacian groups over time. Therefore, there is no evidence of an early phase of small and highly mobile groups preceding larger groups with lower residential mobility and a higher tendency to build structures and make their residential sites more permanent, as predicted by Housley *et al.* (1997). Furthermore, there is no evidence to support a greater provisioning of hunting sites by the building of structures in the later phases of the Aurignacian, as may be expected if knowledge of good locations for foraging developed over time, leading to regular re-use of known hunting sites. However, time averaging could account for this lack of patterning.

Did exploration precede settlement?

The evidence for a phase of exploration preceding major settlement is equivocal. The numbers of sites are high from the earliest period, indicating that there is no early phase with a limited population. The assemblage sizes and number of hearths suggest that a trend in group size and mobility over time does occur, although the assemblage size data shows a slight decrease, whereas the hearths increase. Therefore, it is unclear whether group sizes were larger or smaller later in the Aurignacian, and whether groups were more or less residentially mobile. The proxies that reflect mobility and knowledge of the local region, the presence or absence of structures, the number of species utilised and the distance of raw material transfers, provided no positive results. This implies that the significant results of the assemblage size and number of hearths relates more to the size of groups than the duration of occupation, because long periods of occupancy of a single area demand high levels of local knowledge to prevent resource depletion, and therefore the proxies for regional knowledge should also have produced positive results. Nevertheless, large groups require high levels of local knowledge in order to access sufficient resources, unless high mobility is sustained. Therefore, the results imply that high levels of mobility were maintained throughout the Aurignacian, but group size may have increased over time. However, all of these proxy data sources suffered from low representation in the published archaeological record, and are affected by factors other than mobility, knowledge building and group size; thus, these findings require further verification.

The potential lack of an exploratory phase could be explained by the rapid spread of the Aurignacian, at rates faster than it is possible to detect given the current level of dating resolution (Hazelwood and Steele 2003, 2004). However, this raises the question of how these groups were able to sustain such a fast movement without exploration preceding major settlement. A possible alternative is that the exploration phase does not appear to be Aurignacian, due to a lack of distinctive artefacts, relating to the small groups undertaking a restricted range of activities during this phase (Davies 2001). Therefore, the exploration may be seen in the undiagnostic EUP assemblages. Furthermore, it is possible that exploration occurred before the study period, associated with assemblages that do not differ substantially from the local Middle Palaeolithic, as the modern human groups were also associated with a generic Middle Stone Age technology before 40 Kyr BP.

The lack of clear patterning might be explained by the problems of time averaging due to the poor resolution of the dating methods available at the time range of 40-25 Kyr BP. However, the significant patterning of some factors over time show that it is possible to detect trends, and thus the absence of a relationship with time among the other factors cannot be attributed to poor dating alone. Nevertheless, the other possible explanations of a lack of temporal trends, that rapid gains in knowledge took place, or that exploration preceded the development of Aurignacian features, would also be expected to affect the data regarding assemblage sizes and the number of hearths, and thus cannot entirely account for the absence of patterning in the other proxies for exploration. Spatial averaging of trends could have occurred, as the analysis was conducted at the scale of Europe, rather than regionally; however, as the earliest Aurignacian sites were already widespread it seems that this problem should not affect the results. The absence of a pattern among the raw material transfers, number of species utilised and the presence of structures could be due to their low level of recording in the archaeological publications, resulting in insufficient sample sizes to validate relationships. Alternatively, these factors may not provide good proxies for the processes of movement; however, without more extensive publication of data regarding these factors it is impossible to determine whether or not these data sources can be used in the investigation of population movement.

Aurignacian artefacts.

The types of artefacts found in Aurignacian assemblages were the most widely recorded class of data, of those in the database, in the published record. However, some classes of tools were rarely mentioned in the literature, particularly core types, burins and tools also associated with Middle Palaeolithic industries, such as choppers. These types of artefacts may have been rare in Aurignacian assemblages, but there remains a possibility that they were present but go unmentioned in site reports. This is especially true of cores, which must have been manufactured, but are rarely described. Thus, the data concerning the distinctive Upper Palaeolithic and especially Aurignacian artefact types is of good quality, but the kinds of artefacts regarded as less interesting by many authors may be poorly represented in the database.

Is there evidence of patterning in Aurignacian artefacts over time?

The lithic assemblages of the Aurignacian sites were studied with the aim of determining whether any tool forms were unequally distributed over time, in comparison to the prevalence of Aurignacian sites in the six date categories. The results of the examination of the temporal distribution of Aurignacian artefacts resulted in the identification of the forms that followed the same pattern of prevalence over time as the number of Aurignacian sites, and those that were more widespread earlier or later than the peak of the Aurignacian at 36.5-33 Kyr BP. The results of the chi-squared tests of the null hypothesis that there is no relationship between the date category and number of sites that contained each artefact type further divided the artefacts into those that were significantly associated with time and those that were not. The chi-squared tests produced the same result at all three levels of certainty of Aurignacian presence for each artefact type in all cases except for perforated teeth, where the value of chi-squared was significant for the unlikely and probable sample, but not for the definite Aurignacian data. Therefore, only the definite Aurignacian results will be presented.

The artefacts whose prevalence was found to be significantly related to their date, and matched the distribution of Aurignacian sites over time were: Aurignacian blades, beads, bone/antler tools, burins on truncations, carinated scrapers, debitage, Dufour bladelets, grattoirs, nosed scrapers and prismatic cores. This distribution over time is exemplified in Figure 10.18, which displays the number of sites that contained Aurignacian blades.

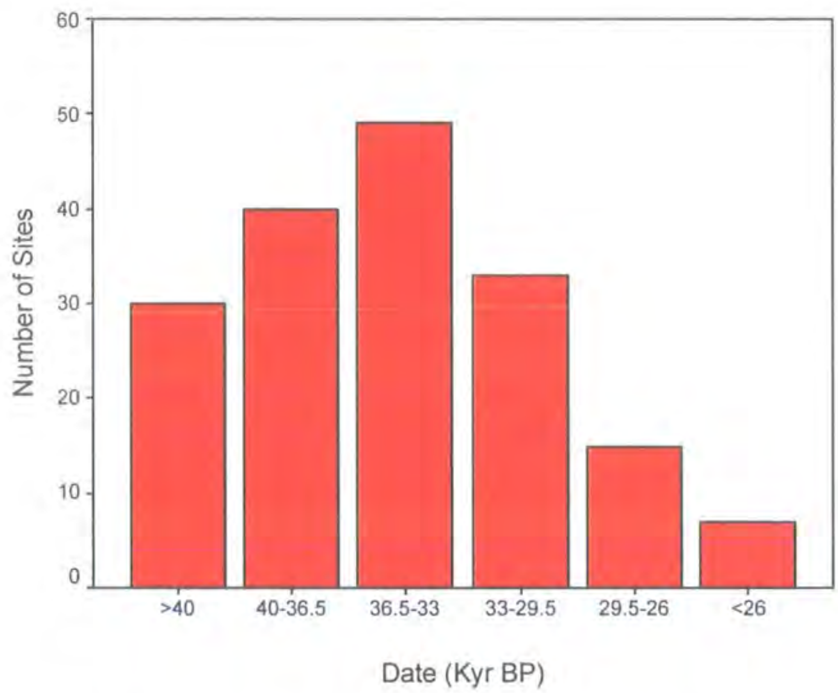

Figure 10.18. Chart showing the number of definite Aurignacian sites that contained Aurignacian blades, in each date category. N=174.

The remaining artefact types that were found to be significantly related to the date categories were: flake tools, marine shell, perforated teeth, split-based bone points and strangulated blades. Figure 10.19 shows the distribution of flake tools over time, demonstrating that this type of artefact was slightly more plentiful in the oldest sites, dated to >40 Kyr BP, than expected from the numbers of Aurignacian sites. Figure 10.20 illustrates that the number of sites containing marine shell is greatest before 36.5 Kyr BP, and that marine shell declines before the Aurignacian itself. Perforated teeth can similarly be seen to be more abundant in the earlier periods than is expected, as presented in Figure 10.21. There are no definite Aurignacian sites with perforated teeth dated younger than 29.5 Kyr BP. Split-based bone points were also predominantly found in the earlier Aurignacian sites, and rapidly decreased towards the end of the Aurignacian, as seen in Figure 10.22. Strangulated blades are likewise significantly biased in their occurrence towards the earlier Aurignacian sites, as presented in Figure 10.23.

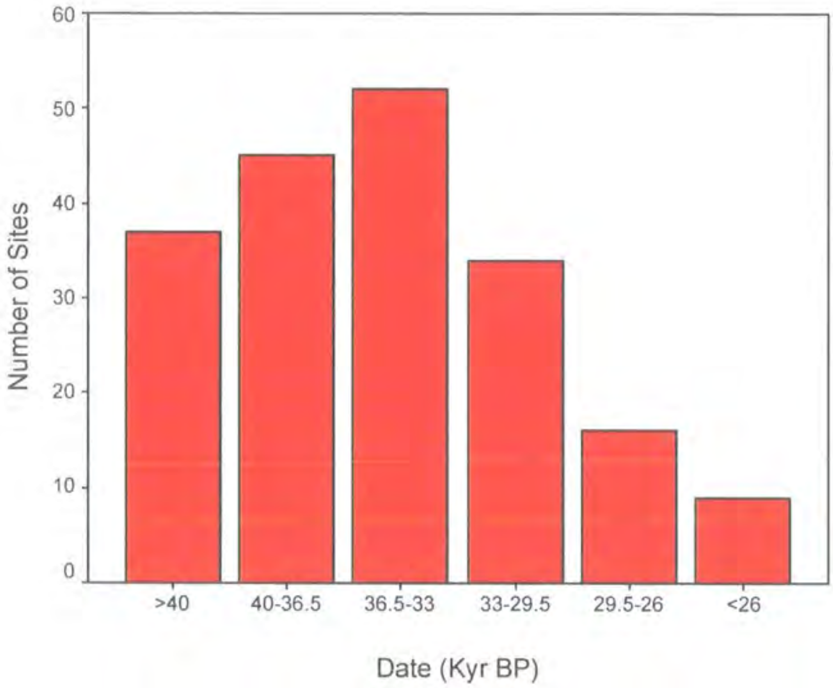

Figure 10.19. Chart showing the number of definite Aurignacian sites that contained flake tools, in each date category. N=193.

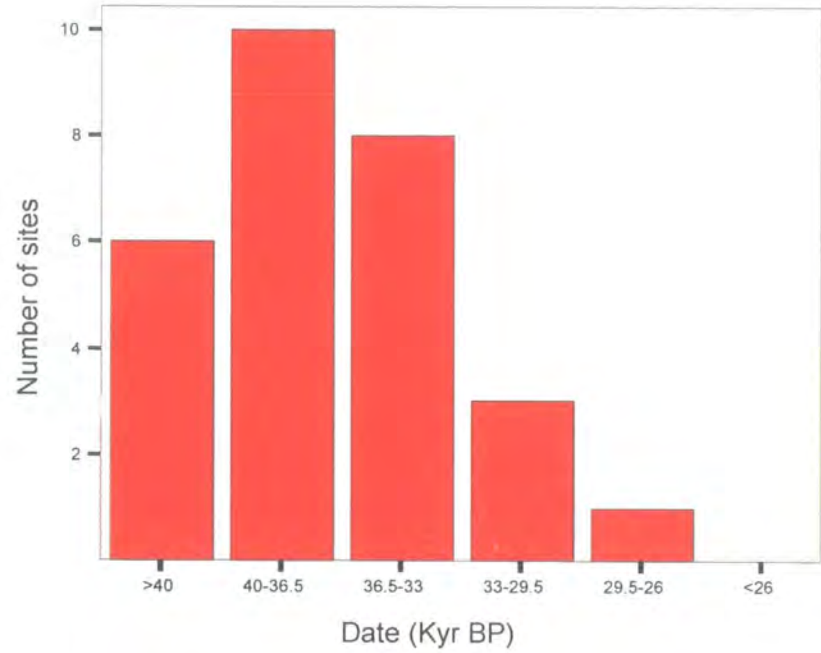

Figure 10.20. Chart showing the number of definite Aurignacian sites that contained marine shell, in each date category. N=28.

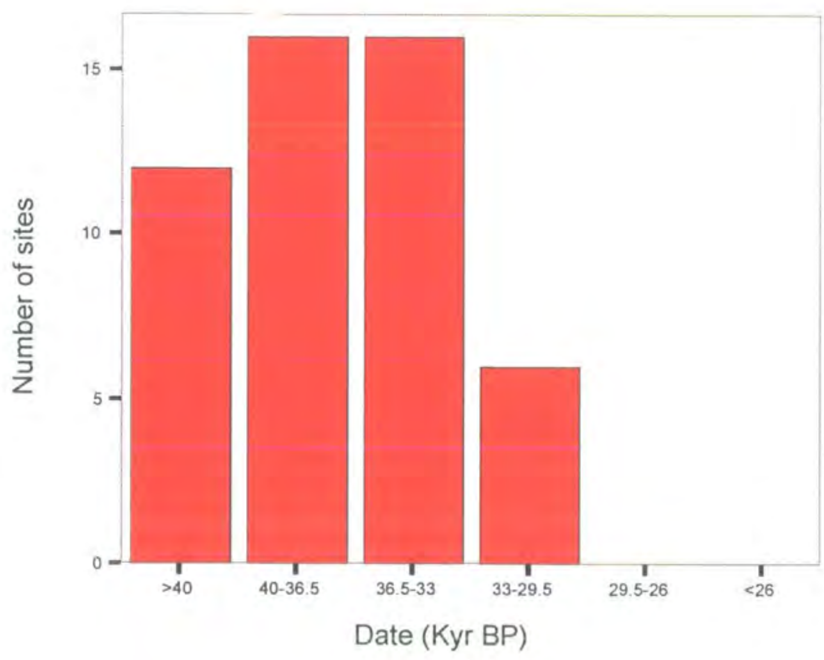

Figure 10.21. Chart showing the number of definite Aurignacian sites that contained perforated teeth, in each date category. N=50.

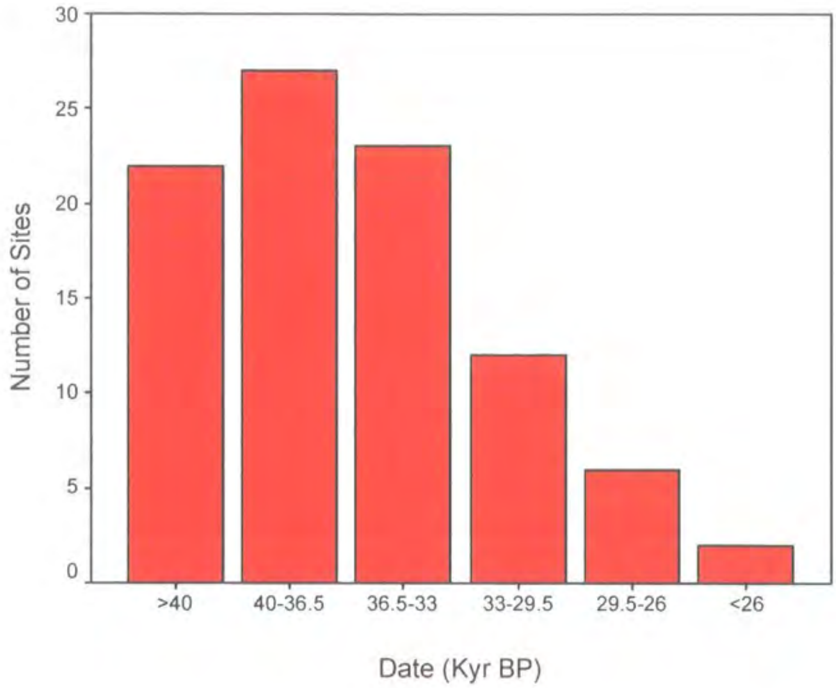

Figure 10.22. Chart showing the number of definite Aurignacian sites that contained split-based bone points, in each date category. N=92.

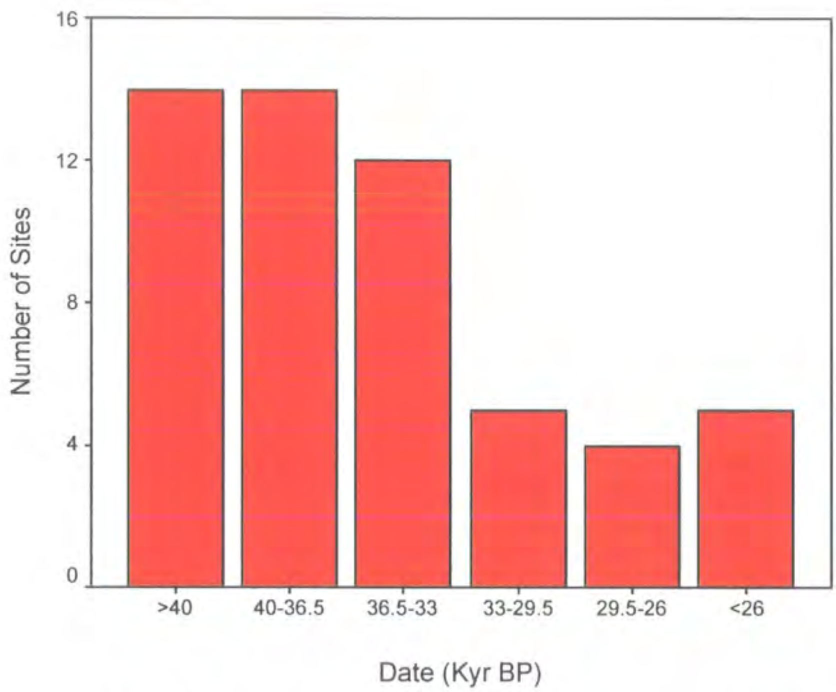

Figure 10.23. Chart showing the number of definite Aurignacian sites that contained strangulated blades, in each date category. N=54.

The other artefacts types do not have a statistically significant temporal distribution; however, bevelled bone points, biconical points, Chatelperronian knives, choppers, Font-Yves bladelets, leaf points, mobilary art, prepared (not prismatic) cores and split pebble cores all occur at greater levels in the earlier periods of the Aurignacian than expected. The numbers of sites that contained each of these types of artefact during each date category are shown in Figures 10.24-10.31. The pattern of decline in prevalence of these artefacts varies, but all are under-represented in the later Aurignacian sites.

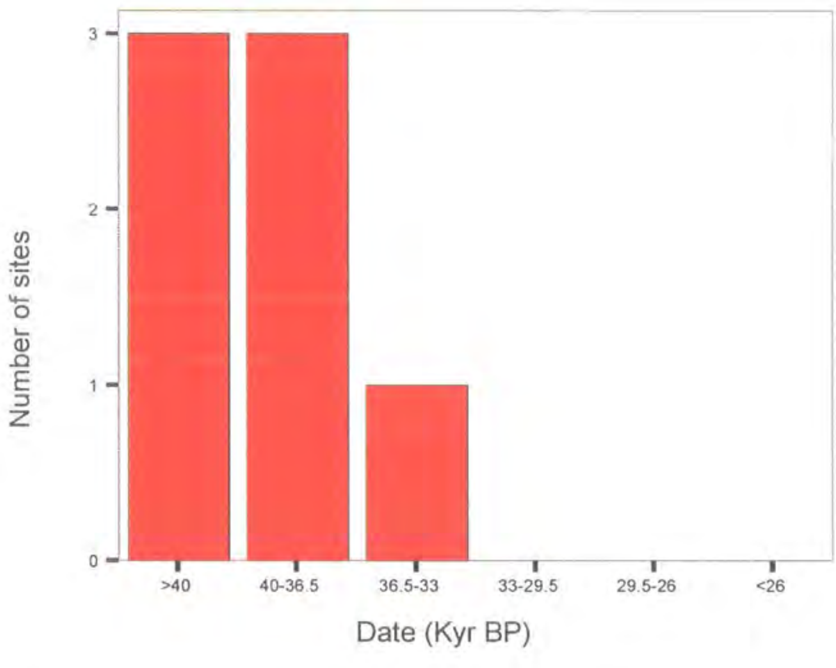

Figure 10.24. Chart showing the number of definite Aurignacian sites that contained bevelled bone points, in each date category. N=7.

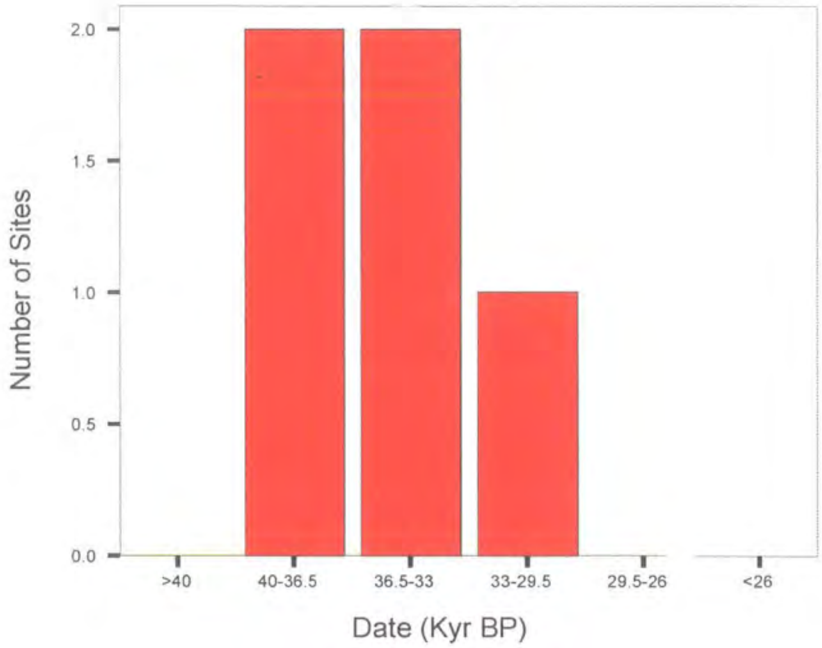

Figure 10.25. Chart showing the number of definite Aurignacian sites that contained biconical points, in each date category. N=5.

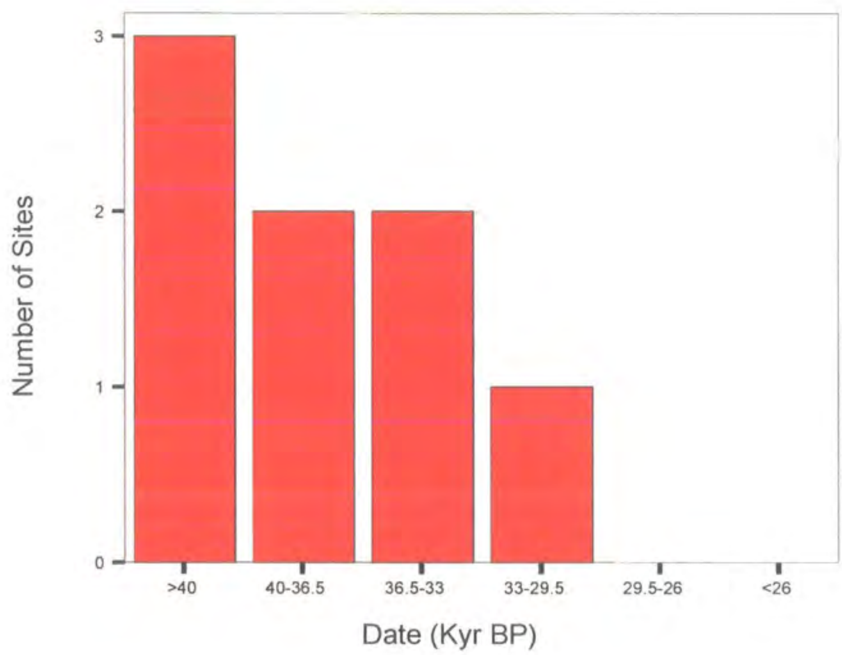

Figure 10.26. Chart showing the number of definite Aurignacian sites that contained Chatelperronian knives, in each date category. N=8.

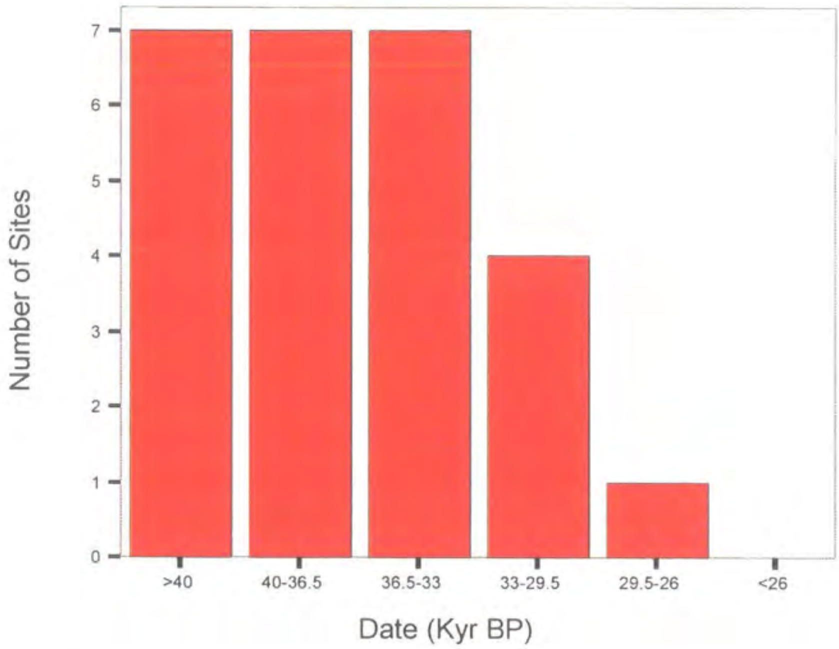

Figure 10.27. Chart showing the number of definite Aurignacian sites that contained choppers, in each date category. N=26.

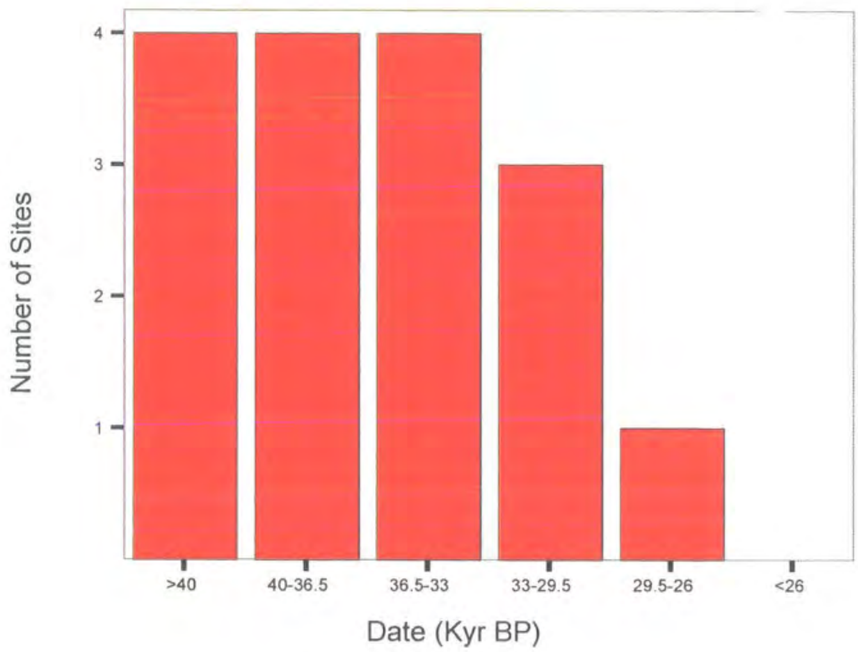

Figure 10.28. Chart showing the number of definite Aurignacian sites that contained leaf points, in each date category. N=16.

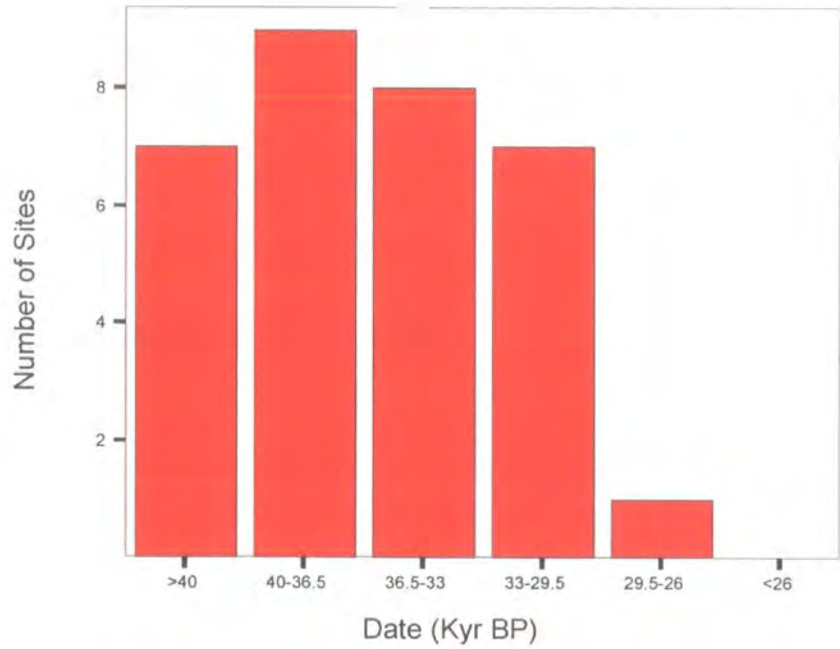

Figure 10.29. Chart showing the number of definite Aurignacian sites that contained mobilary art, in each date category. N=32.

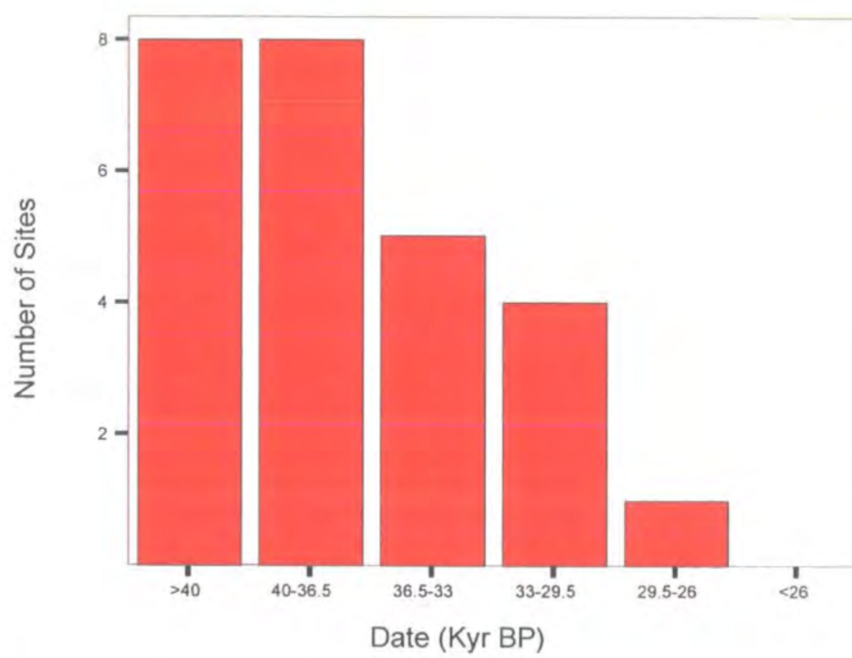

Figure 10.30. Chart showing the number of definite Aurignacian sites that contained prepared (not prismatic) cores, in each date category. N=26.

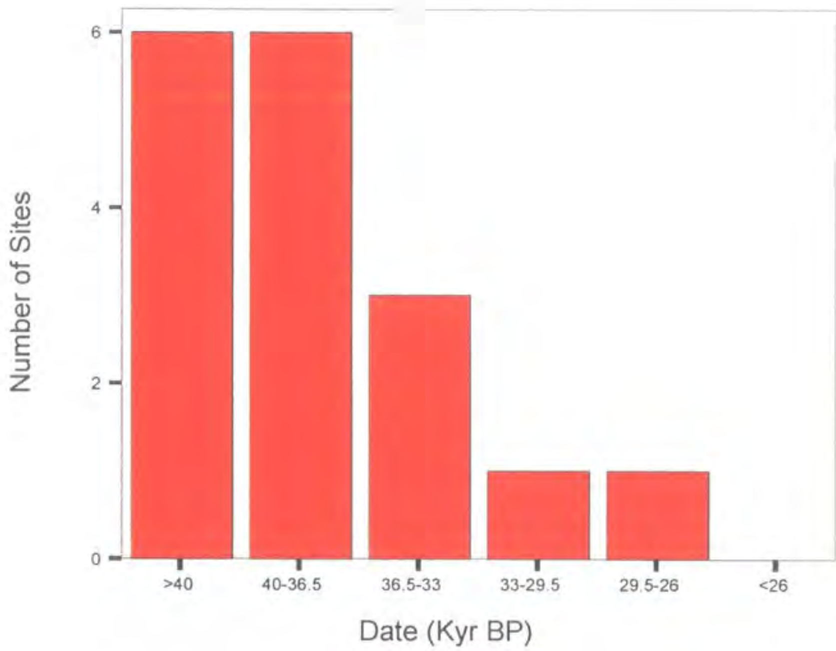

Figure 10.31. Chart showing the number of definite Aurignacian sites that contained split pebble cores, in each date category. N=17.

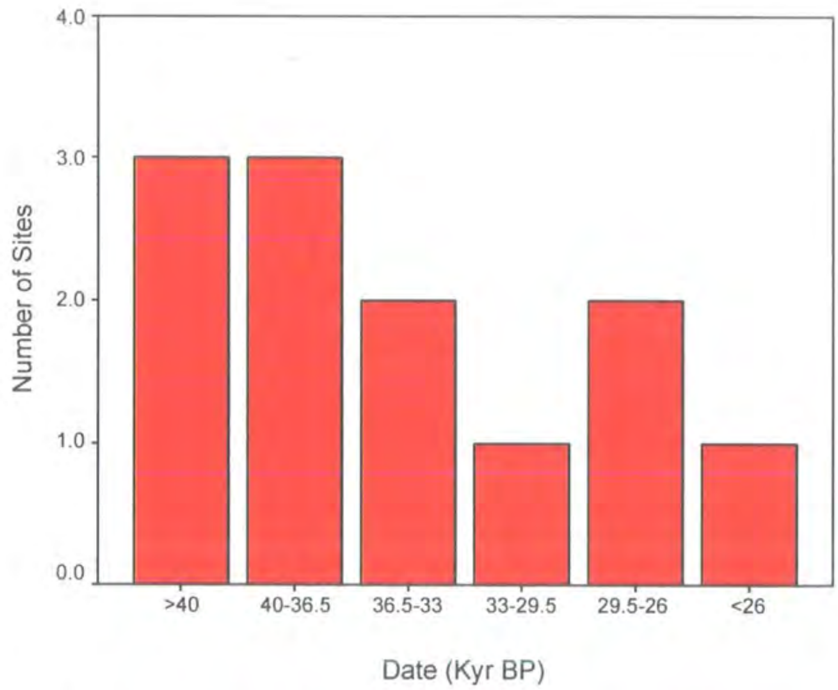

Figure 10.32. Chart showing the number of definite Aurignacian sites that contained Font-Yves bladelets, in each date category. N=12.

Figure 10.32 reveals that Font-Yves bladelets have a particularly unusual temporal distribution, with a rise in the number of sites at which they occurred during the period between 29.5-26 Kyr BP, after an earlier decline.

Backed bladelets, busqué burins, flattened lozengic points, oval lozengic points and Vachons burins form the group of artefacts that occur predominantly in the late Aurignacian sites, after 36.5 Kyr BP. There is no statistical significance to the temporal patterning of any of these artefacts, due to their small sample sizes. However, backed bladelets and Vachons burins are never found in the earlier Aurignacian sites, as shown in Figure 10.33 and Figure 10.34, suggesting that these are characteristic of later Aurignacian assemblages. Parietal art and Uluzzian crescents are recorded in the database at very low levels, and only appear after 36.5 Kyr BP. There are just two recorded instances of both of these artefact types, and parietal art is not found at any definite Aurignacian sites. The temporal distribution of busqué burins, and flattened and oval lozengic points are shown in Figures 10.35-10.37, revealing the skew towards the later sites compared to the number of Aurignacian occurrences overall.

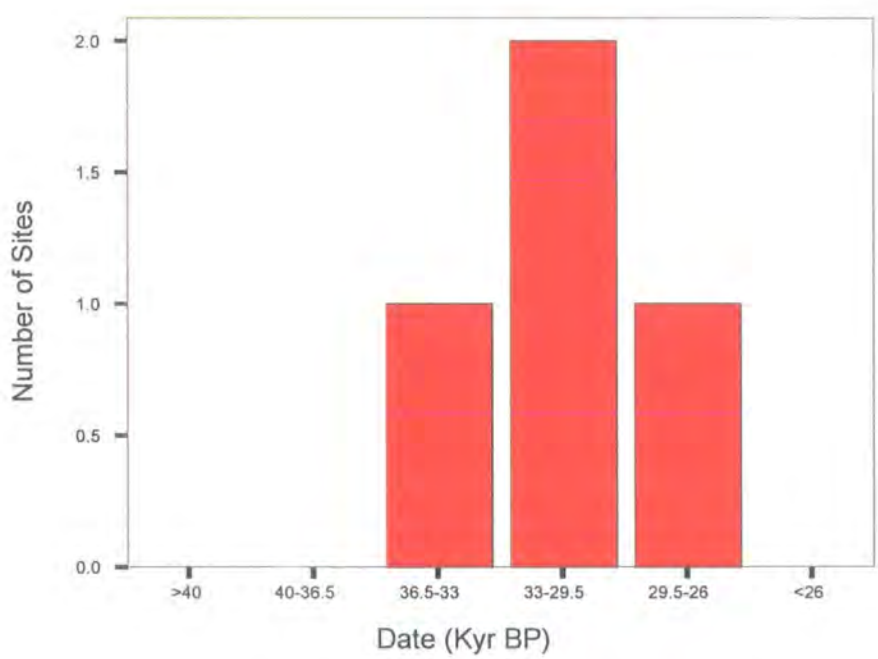

Figure 10.33. Chart showing the number of definite Aurignacian sites that contained backed bladelets, in each date category. N=4.

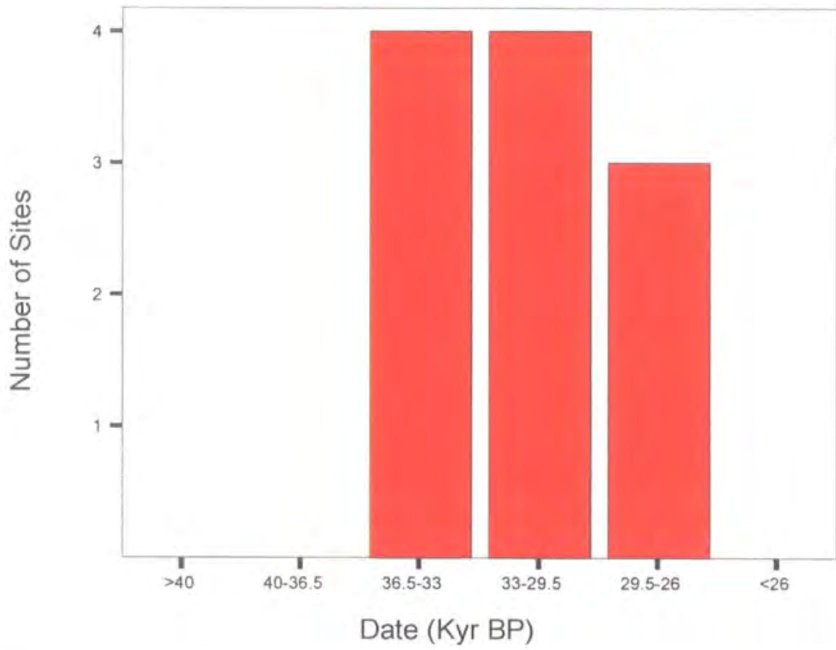

Figure 10.34. Chart showing the number of definite Aurignacian sites that contained Vachons burins, in each date category. N=11.

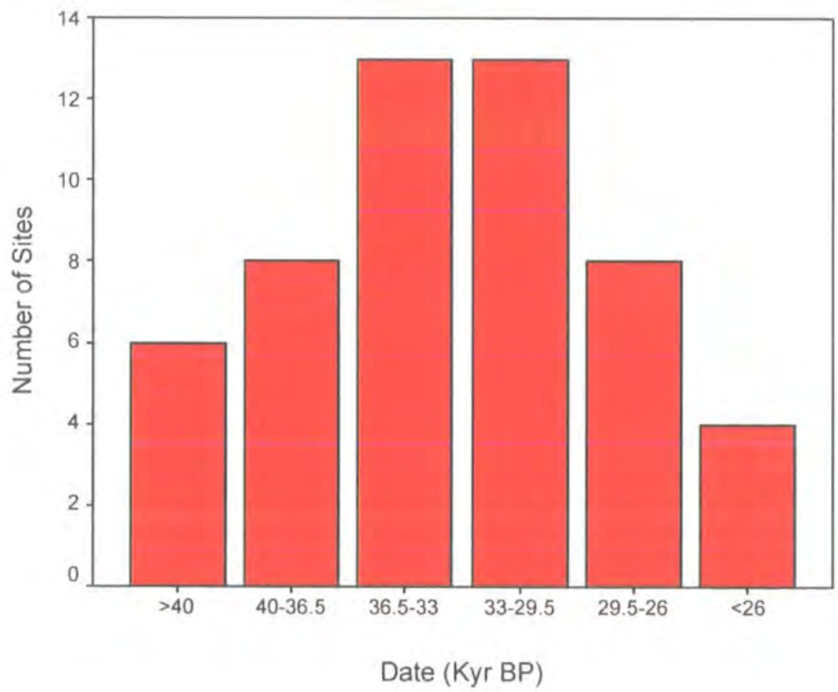

Figure 10.35. Chart showing the number of definite Aurignacian sites that contained busqué burins, in each date category. N=52.

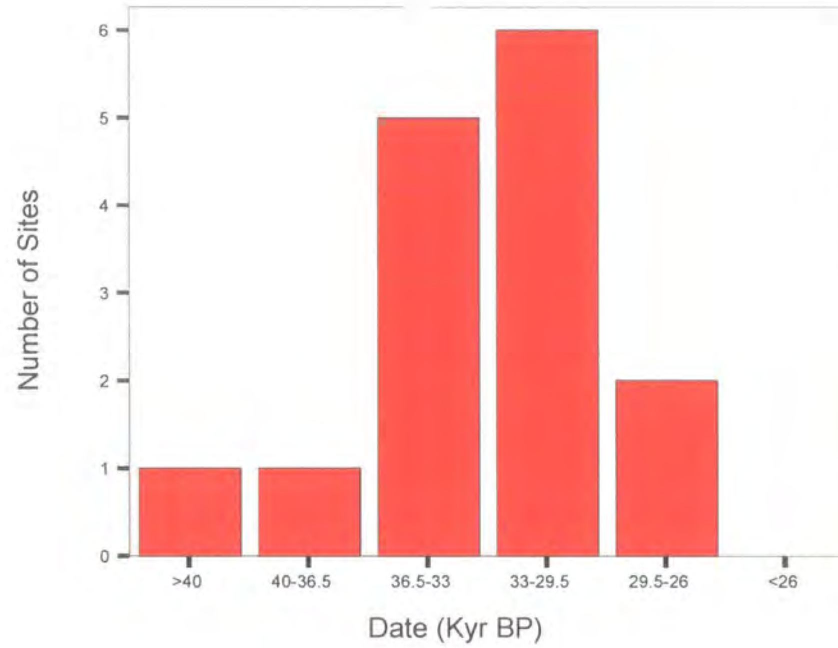

Figure 10.36. Chart showing the number of definite Aurignacian sites that contained flattened lozengic points, in each date category. N=15.

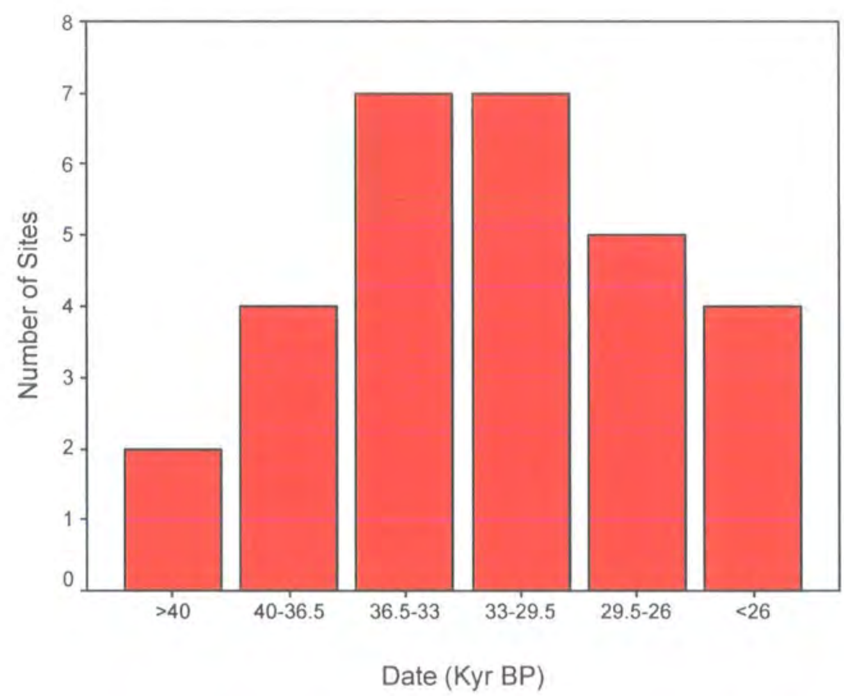

Figure 10.37. Chart showing the number of definite Aurignacian sites that contained oval lozengic points, in each date category. N=29.

The relationship between the temporal patterns of Aurignacian artefacts and movement.

Aurignacian blades, beads, bone/antler tools, burins on truncations, carinated scrapers, debitage, Dufour bladelets, grattoirs, nosed scrapers and prismatic cores were found to vary in prevalence over time in the same manner as the number of Aurignacian sites. These types of artefacts can therefore be considered to be ubiquitous throughout the Aurignacian because their levels of occurrence matches that of the Aurignacian itself. These are the tools that typify and unify the Aurignacian assemblages over time, and with the exception of debitage and grattoirs that are found throughout Upper Palaeolithic industries, these artefacts may be linked to a possible Aurignacian identity. However, the vast duration of the Aurignacian undermines the possibility that people in these groups had a concept of Aurignacian identity in a manner similar to that of modern ethnic groups. Nevertheless, the distinctive stylistic elements of artefacts such as Aurignacian blades, carinated scrapers and nosed scrapers, are characteristic of Aurignacian assemblages, and mark a distinct temporal episode within the European Palaeolithic. The production of these tools was repeatedly undertaken at Aurignacian sites, throughout the 10000-15000 years of the existence of this techno-complex, signifying that some elements of a cohesive body of knowledge of tool production, and perhaps a core social tradition, was shared by groups throughout this period.

A strong ethnic identity is predicted to form among migrant groups (Castles and Miller 1993); therefore, distinctive stylistic markers of Aurignacian populations would be expected. Migrants often develop distinctive and novel means of showing their ethnic identity, and produce uniform styles shared by all members of the group, as cohesiveness is important to groups facing unfamiliar conditions and possibly encountering other ethnic groups. Therefore, the strongly cohesive character of Aurignacian ethnic markers could be related to the movement of these groups. However, the extremely long duration of these forms is not anticipated, as these processes of strong expression of a unified identity are associated with the initial phases of movement before settlement and assimilation occurs, rather than during the later phases of establishment as argued by Davies (2001). Nevertheless, some groups actively reinforce their ethnic identity and maintain distinctions, resulting in a prolonged period of cohesive ethnicity, although not on a timescale analogous to the existence of the Aurignacian.

There are temporal patterns in the occurrence of other tool forms within the Aurignacian, although none have a short duration of existence, as would be expected if these artefact types were identity markers of ethnic groups in a fashion seen amongst contemporary groups. Overall, the artefacts seem to group into an early and late phase of the Aurignacian, subtler sub-divisions are not supported by the results. However, this lack of finer divisions within the Aurignacian techno-complex could be accounted for by the time averaging caused by the poor resolution of the dating methods available for this period. The Aurignacian has been sub-divided into several phases based on type fossils such as Dufour bladelets, split-based bone points, lozengic points and busqué burins (Davies 1999), using boundaries based on stratigraphy, which may detect finer scale temporal changes than the absolute dates used in this study. Therefore, the temporal patterns detected cannot be used to dismiss the phases of the Aurignacian, as the methods of detecting changes in assemblage compositions are not comparable. Nevertheless, the temporal patterns detected are sufficient to address questions concerning the behaviours surrounding movement, as these require patterns of variation at the spatial scale of the movement, covering the whole of Europe, rather than the detailed local sequences that have traditionally been used to sub-divide the Aurignacian. Furthermore, many recent detailed stratigraphic studies have found that the Aurignacian has been overly sub-divided in traditional regional systematics and only clearly separates into two phases, the Aurignacian I and II, with the Aurignacian III-V not supported by modern excavations (Rigaud 1982; Brooks 1995; Sackett 1999).

The artefact types significantly associated with the early Aurignacian are: flake tools, marine shell, perforated teeth, split-based bone points and strangulated blades. Additionally, bevelled bone points, biconical points, Chatelperronian knives, choppers, Font-Yves bladelets, leaf points, mobilary art, prepared (not prismatic) cores and split pebble cores occur at higher levels in early sites than expected, given the temporal distribution of the Aurignacian as a whole, although the temporal patterning of these tools is not statistically significant. The lack of significant patterning among these artefacts can be explained by their rarity. Amongst these artefacts are types associated with the Middle Palaeolithic and the transitional industries, which can perhaps be explained by mixing of assemblages in the lowest levels of Aurignacian sites, or by the early Aurignacian retaining features of its Middle Stone Age or Middle Palaeolithic origins, before the development of the full Upper Palaeolithic.

The early artefacts are also characterised by the presence of highly distinctive forms of artefacts, and especially by mobilary art, perforated teeth and marine shell, which are used as personal ornamentation and express identity, and can be transported as the individual migrates. It is significant that these artefact types occur in the earlier assemblages, whereas the few occurrences of parietal art, which marks associations with locations, occur at the end of the existence of the Aurignacian. Although mobilary and parietal art occurrences are not statistically significantly patterned, this division into early mobile symbolism and later locational static symbolism supports the process of strong identity marking among the initial migrants before settlement (Castles and Miller 1993), followed by a decline in the expression of personal identity and an increase in the importance of the meanings of places (Kelly 2003). The lack of significant temporal patterning is probably the result of the small number of finds of Aurignacian art. However, if marine shell, perforated teeth and mobilary art are considered as a group, the number of finds in the earlier Aurignacian is raised to levels that could indicate an important pattern. This finding could lend support to Gamble's suggestion that communication through stylistic encoding and symbolism was connected to the successful spread of the Upper Palaeolithic. However, it does not support his contention that locations were symbolically constructed as part of the social landscape during movement.

The artefacts that are found in greater numbers after the peak occurrence of the Aurignacian at 36.5-33 Kyr BP are: backed bladelets, busqué burins, flattened lozengic points, oval lozengic points, and Vachons burins. Additionally, Uluzzian crescents and parietal art have only been discovered in Aurignacian sites post-dating the peak time of occurrence, refuting the argument of d'Errico *et al.* (1998) and Zilhão and d'Errico (1999) that the Uluzzian precedes the Aurignacian. However, there is no statistical significance to the temporal patterning of any of these artefacts, which is probably caused by the small number of occurrences of each form. Nevertheless, it is possible that these artefacts are associated with a later Aurignacian phase, and replaced the types typical of the earlier sites. Moreover, as the number of sites declined at the end of the Aurignacian, the rarity and lack of statistical significance of the relationship to time of these artefacts could be explained by decreased instances of the Aurignacian. These forms could represent innovation in technology as a result of isolation and a release from the cultural norms of the parent group, as predicted in sociological models of movement (Milroy and Milroy 1997; Grieco 1998). Alternatively, the development of these artefacts could be caused by technological solutions being developed to overcome problems encountered with the use of the earlier Aurignacian tool forms, such as the tendency for split-based bone points to break (Mellars pers. comm.).

Are there spatial patterns in the distribution of Aurignacian artefacts?

Figures 10.38-10.41 display the sites of the artefacts in definite Aurignacian assemblages. The maps of the locations in which each type of artefact had been recovered were not plotted for the uncertain Aurignacian sites because no differences were identified between the datasets at the three levels of confidence of Aurignacian presence. Investigation into the spatial patterning of the Aurignacian artefacts found that the majority of the artefacts occurred throughout the range of Aurignacian existence, at the same frequency as Aurignacian sites. The artefacts that fall into this category are: Aurignacian blades, bone/antler tools, burins on truncations, carinated scrapers, crested blades, debitage, dihedral burins, flake tools, Dufour bladelets, grattoirs, nosed scrapers, perforated teeth, prismatic cores, split-based bone points, prepared (not prismatic) cores and split pebble cores. These artefact types are not displayed.

Beads, choppers, Font-Yves bladelets, oval lozengic points, and flattened lozengic points were found to occur only in areas where clusters of Aurignacian sites existed. Figure 10.38 shows the location of the sites where these artefacts have been recovered.

Marine shell, mobilary art, strangulated blades, biconical points, busqué burins, Chatelperronian knives and Vachons burins have only been identified in the west of the range of the Aurignacian, and are displayed in Figure 10.39.

Backed bladelets and bevelled bone points have only been identified in sites in the east of the range of the Aurignacian, as illustrated in Figure 10.40.

The remaining artefact types that show interesting spatial patterning are Uluzzian crescents and leaf points. The Uluzzian crescents are only found in one definitely Aurignacian site in southern Italy, whereas leaf points have been recovered from several sites, mainly in Eastern Europe, as shown in Figure 10.41. Leaf points have never been found in Southern European Aurignacian sites.

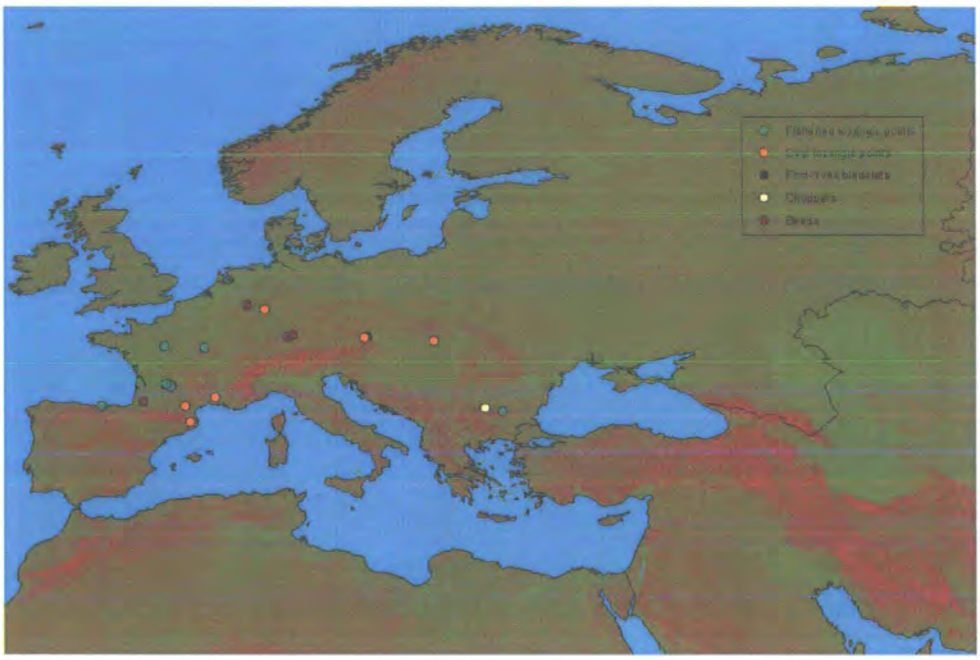

Figure 10.38. Map showing the location of the Aurignacian artefact types that are rare and only occur in areas with large clusters of sites.

Figure 10.39. Map showing the location of the Aurignacian artefact types that predominantly occur in the west.

Figure 10.40. Map showing the location of the Aurignacian artefact types that predominantly occur in the east.

Figure 10.41. Map showing the location of the Uluzzian crescents and leaf points in definite Aurignacian assemblages.

The relationship between the spatial patterning of Aurignacian artefacts and movement.

Spatial patterns in the occurrence of distinctive artefact types are expected to develop once settlement becomes established. In the initial phases of a movement a unifying ethnicity is often shared by all migrant groups from a shared origin, resulting in similarities in material culture throughout the area occupied by the migrants (Castles and Miller 1993). However, once settlement had been achieved, further movements have stopped, and groups have been resident in a single area for some time, regional variations in ethnicity and its material expressions are anticipated to develop. Moreover, if expansion occurred from independent regional centres, as suggested by Bocquet-Appel and Demars (2000), regional characteristics may have developed within groups associated with each centre during the earlier phases of movement.

The majority of the Aurignacian artefact types were found to occur throughout the area occupied. These ubiquitous tools were: Aurignacian blades, bone/antler tools, burins on truncations, carinated scrapers, crested blades, debitage, dihedral burins, flake tools, Dufour bladelets, grattoirs, nosed scrapers, perforated teeth, prismatic cores, split-based bone points, prepared (not prismatic) cores and split pebble cores. Aurignacian blades, bone/antler tools, burins on truncations, carinated scrapers, debitage, Dufour bladelets, grattoirs, nosed scrapers, prismatic cores, and possibly flake tools and crested blades were also found to occur throughout the duration of the Aurignacian, and thus are the artefacts that are common to the entire Aurignacian techno-complex. Split-based bone points, split pebble cores and prepared (not prismatic) cores were found to occur predominantly in the earlier Aurignacian sites, and hence can be treated as ubiquitous elements of the earlier Aurignacian. Additionally, beads, choppers, Font-Yves bladelets, oval lozengic points, and flattened lozengic points coincided spatially with clusters of Aurignacian sites, shown in Figure 10.38. Figure 10.43, discussed in the following section, demonstrates that these types of artefacts are found almost exclusively in large assemblages, and therefore their association with large clusters of Aurignacian sites is probably explained as a sampling effect due to their rarity, and these artefacts can be added to the ubiquitous aspects of the spatial occurrence of the Aurignacian.

Artefact types that occur only in the west of the area of Aurignacian occupation are marine shell, mobilary art, strangulated blades, biconical points, busqué burins, Chatelperronian knives and Vachons burins. The majority of these artefact types also occur mainly in the early Aurignacian sites, with the exception of Vachons burins and busqué burins, which occur mostly in sites after the peak occurrence of the Aurignacian at 36.5-33 Kyr BP. Backed bladelets and bevelled bone points were limited to the eastern area of the Aurignacian; however, these artefact types are extremely rare and this biased spatial distribution could be a sampling effect. The remaining spatial patterns are seen among Uluzzian crescents and leaf points, which could be explained by these tool types being intrusive in Aurignacian sites, as these artefacts are more commonly associated with the local transitional industries in the regions in which they occur. The early western artefacts demonstrate that regional patterning did exist from the beginning of the Aurignacian, contrary to expectations of early Aurignacian unity (Davies 1999, 2001), but fitting the model of regional centres of movement within the overall unified techno-complex (Bocquet-Appel and Demars 2000). Furthermore, it is possible that an early unified phase is not being detected due to the poor dating resolution and the potentially small number of sites involved in the initial movement.

The spatial patterning could be indicative of regional innovations occurring as a result of movement causing social isolation, breaking down the classical Aurignacian assemblage characteristics at the edge of the range of the techno-complex, and allowing innovation. This may be a more appropriate expectation of technological developments among hunter-gatherer groups moving into new territory, as the lack of modern communications would undermine the strength of the uniform phase of material culture at the beginning of the process of spread, as groups became relatively isolated early in the movement. Modern migrations that form the basis of the sociological and geographical models, which produced the expectation of initial uniformity therefore may not be appropriate. Innovation is associated with population movement in both ecological and sociological models, thus the finding of regional variants from the early phase of the Aurignacian could reflect a process of release from the social constraints in operation in the parent population, as well as a response to the novel conditions encountered in Europe. Thus, despite the seeming uniformity of Aurignacian assemblages, regional and temporal variants do exist, contra Davies (1999; 2001), which suggests that the groups manufacturing these industries acted in a manner more similar to human groups in the present, and the variations may be linked to the processes of movement.

The limitation of spatial grouping among Aurignacian forms to an eastern and a western group only, could be the result of the high level of mobility of the Aurignacian population, which could have prevented further regional idiosyncrasies from developing. Moreover, the fluid social boundaries anticipated to be present in low-density hunter-gatherer groups would also act to prevent regional groups becoming socially isolated and developing unique forms of artefacts.

What factors may have influenced the nature of Aurignacian assemblages?

The patterning of the artefact types was investigated in order to establish whether the environment of Aurignacian sites affected the nature of the assemblages. The chi-squared tests of the null hypothesis that there is no relationship between the environment and artefact types provided invalid results, and lambda was insignificant at all levels of certainty of Aurignacian presence. Each artefact type was mostly recovered from temperate grassland/steppe, with some instances in temperate shrubland, and few in alpine grassland and temperate woodland, as shown in Figure 10.42.

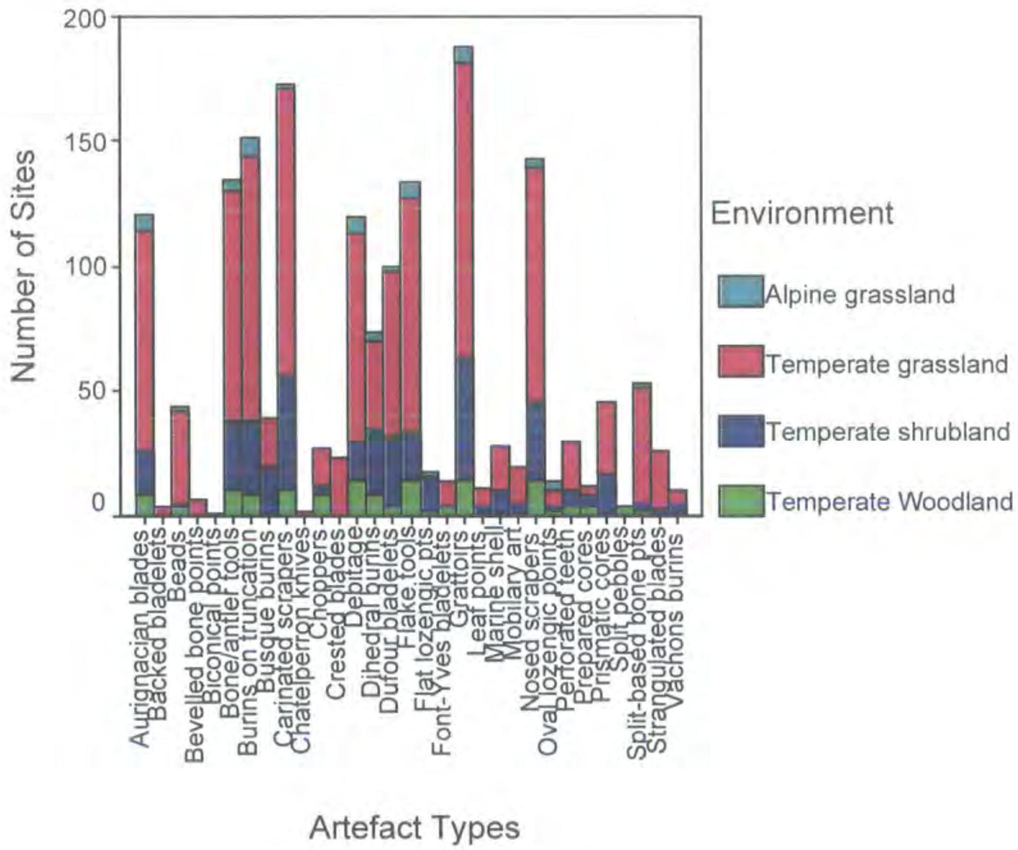

Figure 10.42. Chart showing the number of definite Aurignacian sites with a recorded occurrence of each artefact type, in each environmental type. N=1772.

The effect of assemblage size on the artefacts represented at Aurignacian sites was examined using chi-squared and lambda tests of the null hypothesis that there is no relationship between the environment and artefact types. The chi-squared results were invalid, but lambda produced significant results at all levels of certainty of Aurignacian presence, using both divisions of assemblage size classes defined on page 436. Figure 10.43 shows the number of occurrences of each artefact type in each assemblage size for the definite Aurignacian sites. This demonstrates that backed bladelets, crested blades, prepared (not prismatic) cores and split pebble cores are only found in large assemblages. However, lambda indicated a weak relationship between the size of an assemblage and the types of artefacts that it contains at all levels of confidence of Aurignacian presence, with a maximum value of lambda=0.045 (α=0) when the undiagnostic possible Aurignacian EUP sites were included in the analysis.

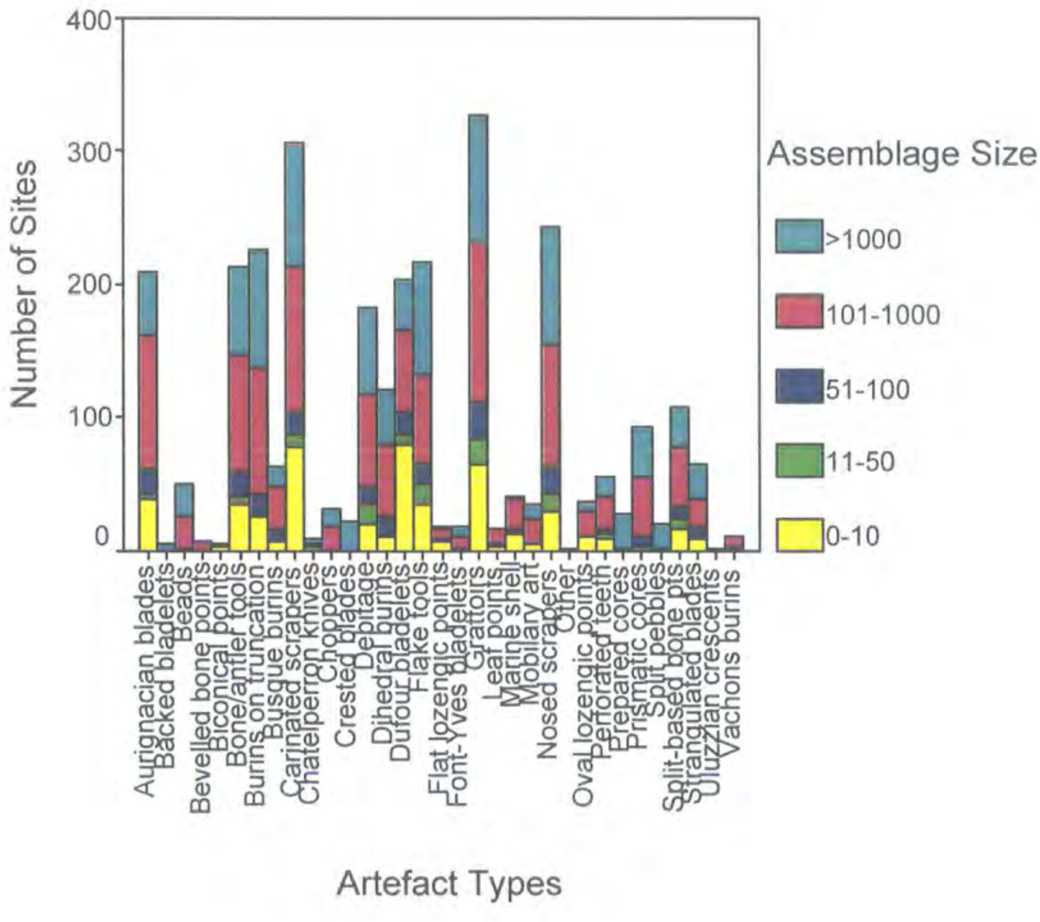

Figure 10.43. Chart showing the number of definite Aurignacian sites with a recorded occurrence of each type of artefact, in each size of assemblage. N=3013.

The impact of the environment and assemblage size on the artefacts represented in Aurignacian assemblages.

The possibility that variance in Aurignacian artefacts was caused by responses to environmental conditions, or was simply the result of rare types occurring in large assemblages was investigated. There is a significant but weak relationship between assemblage size and artefact types, but not between the environmental categories and artefact types. In general, the number of sites in each environment in which each artefact type occurs reflects the level of Aurignacian presence in each biome, shown in Figure 10.42. The tools that are not predominantly found in steppe include flattened lozengic points and split pebble cores, which are rare and thus these absences may not reflect a distinct behavioural pattern, but instead chance effects in small samples. However, other rare forms, such as bevelled bone points, marine shell and mobilary art have not been recovered from the less frequently occupied environments of alpine grassland and temperate woodland. Therefore, there may be some underlying cause for these associations, rather than the simple matter of sampling problems. Nevertheless, the lack of a relationship between artefact types and environment allows the temporal and spatial patterns discussed above to be interpreted in the behavioural framework of movement, rather than being environmentally driven.

The weak relationship between assemblage size and artefact types further reinforces the possibility of interpreting the artefact data in terms of behaviours during movement, because the patterns revealed can mostly be explained as a result of rare artefact types appearing in the larger assemblages, and thus being accounted for by sampling, or by a more extensive range of activities taking place in the larger sites. There is no evidence of particular artefact types being recovered exclusively from small assemblages, which would suggest specialised site functions. Therefore, the smaller sites contained reduced but typical ranges of tools, as predicted by the model of exploration being undertaken by small and highly mobile groups performing a limited range of tasks, and thus manufacturing and discarding a reduced range of technological forms. However, it is possible that the relationship between rare tool forms and large sites is caused by archaeological recording, thus rare forms are only published when extensive excavations and publication has been completed. This possibility is reinforced by the fact that many of the unusual artefacts are types of manufacturing debris, which must have been present in many sites, but are infrequently listed in publications. Alternatively, tool manufacturing was limited to the larger sites, and the smaller sites were functionally specialised foraging locations that tools were brought into already fully manufactured. Nonetheless, as assemblage size accounts for 5-9% of the variance in artefact occurrence, potential explanations of artefact variation relating to the processes of movement, and temporal and spatial trends remain valid. Furthermore, as assemblage size is weakly related to time, and some artefact types are also significantly related to time, the linkage between the assemblage sizes and types of artefacts may be caused by the temporal relationships of both factors.

Conclusions.

In conclusion, the proxy sources of data concerning the behaviours associated with the initial phases of movement have not provided a clear picture of exploration during the early Aurignacian. This could be explained by the time averaging caused by the large standard deviations of radiocarbon dates during this period, the occurrence of very rapid movement, the exploration not being recognised as Aurignacian in the archaeological record, or by the proxies providing poor sources of data regarding exploration. The spatial and temporal data discussed in Chapter 8, and the environmental and ecological data explored in Chapter 9 reinforce the picture of a lack of exploration during the Aurignacian. Therefore, the Aurignacian was widespread across the mid-latitudes of Europe, with a relatively large population, and the full range of behaviours during the earliest date category. However, the spatial data presented in this chapter suggest that spread into the peripheries of Europe can be detected, and secondary dispersal into smaller sites might be indicated. Thus, the Aurignacian data provides less support for the exploration model of movement than the Lower Palaeolithic data, which showed a process of gradual spread spatially, and in terms of occupation of an increasing range of environments and landscapes.

However, the Aurignacian artefacts show some temporal and spatial patterning that may be related to movement, as a result of innovation responding to novel conditions and release from the behavioural constraints of the society at the origin. The equivalent data from the Lower Palaeolithic did not demonstrate that innovation or spatial and temporal groupings of artefacts occurred; therefore, the Upper Palaeolithic data provides clearer evidence of behavioural change associated with movement.

The differences between the two study periods, and the manner in which the data from both movements relates to the models presented in Chapters 2 and 3 will be discussed further in the following chapter.

Chapter 11 : Connections between the Lower Palaeolithic and Aurignacian data and the models of movement.

This chapter will address the issue of how the patterns revealed in the data and their causes relate to the archaeological models of dispersal processes and the biogeographical, sociological and geographical models of population movement. The strengths and weaknesses of each of the models will be explored, and the aspects that are worthy of inclusion in future studies of population movements will be highlighted. This chapter will begin with a comparison between the findings concerning the two study periods. The similarities and differences between the movements that occurred during the two study periods, and the manner in which they match or refute the expectations of the archaeological models of the four authors discussed in Chapter 3 will then be examined, with the aspects of the data that relate to the models. The biological, sociological and geographical models will then be assessed in the light of the findings presented in Chapters 5-10.

The similarities and differences between the movements during the Lower Palaeolithic and the Aurignacian.

Table 11.1 summarises and compares the results of the findings of the Lower Palaeolithic and Aurignacian case studies, in terms of the presence or absence of evidence of the processes of movement predicted by the ecological, sociological and geographical models discussed in Chapter 2 and the archaeological models discussed in Chapter 3. In general, the Lower Palaeolithic movements were slower, showed gradual spread across Europe following exploration, and were related to ecological circumstances. The movement of the Aurignacian was very rapid in comparison to the Lower Palaeolithic, leaving no strong evidence of exploration, and showing poor linkage to the ecological conditions in Europe during OIS 3. The movements in both study periods followed riverine corridors, and potentially revealed the presence of destination nodes and secondary dispersal after establishment of occupation. During the Lower Palaeolithic movements were characterised by technological loss, whereas in the Aurignacian innovation and the development of portable stylised objects reflecting social identity were associated with the early period of movement. It can be seen that despite the poor dating resolution of the Lower Palaeolithic data, many of the features of movement predicted to be seen by the models have been detected, whereas the Upper Palaeolithic data has not revealed processes such as exploration, due to the speed of spread with respect to the resolution of the radiocarbon dates. The manner in which these findings relate to the models of movement will be discussed in the following sections.

Movement Process	Lower Palaeolithic	Upper Palaeolithic
Growth of population from small size	Yes	No
Spatially restricted occupation, then spread	Yes	Possibly
Rapid movement	No	Yes
Increasing diversity of landscapes occupied over time	Yes	No
Movement through riverine corridors	Yes	Yes
Sequence of environments occupied, related to conditions at the origin	Yes	No
Physical change and adaptation	Yes	No
Movement during faunal turnover	Yes	No
Movement part of faunal dispersal	Yes in Early Pleistocene, possibly in Middle Pleistocene	No
Ability to cope with competition	Possibly	Yes
Initially ephemeral occupation	Yes	No
Increasing group size over time	Possibly	No
Increasing local knowledge over time	No	No
Population clustered in destination nodes	Possibly	Yes
Secondary dispersal after initial movement	Possibly	Possibly

Movement Process	Lower Palaeolithic	Upper Palaeolithic
Decreasing mobility over time	Possibly	Possibly
Behavioural changes during/after movement	Yes	Yes
Behavioural innovation	No	Yes
Development of strong identity	No	Yes
Exploration	Possibly	No

Table 11.1. Table comparing the detection of the expected processes of movement in the Lower Palaeolithic and the Aurignacian.

The archaeological models.

Each of the four models will be discussed, and the data supporting or undermining the precepts of the models will be highlighted. The applicability of each model to the events of both the study periods will then be considered. The aspects of the models that have been found to be worthwhile and useful for future studies will also be reviewed.

Gamble's model.

The regional environment model.
Gamble (1986) suggests that the Lower Palaeolithic occupation of Europe took place simultaneously at around 500 Kyr BP in all regions except the northeast, which was occupied later. The Lower Palaeolithic data clearly refute this suggestion, as southern and western areas of Europe were occupied before this date, and hominids subsequently moved into the northwest and finally the northeast, providing greater support for his recent claim that southern Europe was occupied before the north (Gamble 1998b). Gamble argues that Lower Palaeolithic groups would not have been able to cope with the continentality and uniformity of resources in the northeast. However, Aurignacian groups also appear not to have occupied the northeast, undermining the argument that the social capacities of *Homo sapiens*, particularly communication through stylistic encoding, are connected to the occupation of

continental climatic zones, as Aurignacian groups certainly had these abilities. Moreover, hominid presence in this region is suggested to date from OIS 11 and more certainly from OIS 9, without the stylistic encoding predicted by Gamble. Upper Palaeolithic settlement of Europe is predicted to be more continuous than in the Lower Palaeolithic due to the presumed better environmental adaptations. The data does show discontinuities in Lower Palaeolithic occupation as Gamble suggests; however, as the time scale of the Lower Palaeolithic study is far greater than the Aurignacian the levels of continuity are not comparable, especially as the environmental circumstances are not identical in the two case studies.

Gamble argues that social developments drove colonisation and therefore that speciation, technological developments and cognitive changes should not coincide with movement. However, the Lower Palaeolithic events may be associated with the speciation of *Homo antecessor* and *Homo heidelbergensis*. Technological developments do not seem to coincide with the initial occupation of Europe, and the study did not address cognitive issues. The movement of the Aurignacian does appear to be independent of speciation and cognitive developments, unless Klein's (1998) proposal of cognitive modernity evolving as late as 50 Kyr BP is accepted. However, Aurignacian movement is certainly associated with the emergence of Upper Palaeolithic technology, countering Gamble's argument. Furthermore, he proposes that social change will precede rather than follow episodes of movement, whereas the Aurignacian data suggests innovation occurred after, as well as before colonisation.

The suggestion that Lower Palaeolithic dispersal was a response to changing climatic conditions creating intermediate environments of open woodland is supported by the high numbers of sites in temperate woodland conditions. However, Gamble's denial of the Lower Palaeolithic occupation of steppe or forests is not supported by the data. Moreover, his suggestion that Lower Palaeolithic groups would be restricted to easy environments with plentiful resources, such as river valleys, is supported by the data, but this pattern is also seen in the Aurignacian, which supposedly was free of these constraints. The environmental matching model of the mid 1990s proposed that grasslands were the first habitats to be occupied, which is seen in the data, but woodlands and shrublands were occupied from an equal age.

Local hominid networks and social landscapes.

The local hominid network model suggests that groups were socially isolated within ranges of 40 Km, and were only capable of slow expansion until the development of the social landscape, coinciding with the emergence of the Upper Palaeolithic. The Lower Palaeolithic data do support a slow expansion and the lack of evidence for interaction beyond the 40 Km range boundary. However, the lack of regional behaviours is not clearly seen in the data when the temporal and the spatial patterns of the occurrence of the Acheulean are considered. The social landscape of the Upper Palaeolithic is expected to include symbolism and locational meanings, as well as regional styles, long distance raw material transfers and occupation of difficult environments. The symbolic aspects of the Aurignacian suggest that locations were not assigned meanings until after the colonisation had occurred, as parietal art is lacking in the early Aurignacian, undermining the argument that the symbolic associations of places facilitated rapid spread. Furthermore, the higher levels of mobilary art and potentially symbolic objects such as marine shell and perforated teeth in the earlier periods of the Aurignacian suggest that mobile means of expressing identity were more important than symbolic locations during the movement across Europe. Regional styles of artefacts were present in the Aurignacian, but the majority of artefacts were ubiquitous or temporally patterned, rather than spatially diverse. Moreover, the Aurignacian only divides into a western and an eastern region, suggesting that regional behaviours were not a marked aspect of this period. Furthermore, Aurignacian sites have not been recovered in environments that lacked occupation in the Lower Palaeolithic; thus, the symbolic communication of these groups does not appear to have allowed their spread into harsher habitats than those occupied by groups lacking these behaviours. Nevertheless, the raw material transfer distances do show consistently high levels of movement across Europe, supporting the claim of longer range interactions, although this may indicate high personal mobility rather than extended social networks.

Foley's model.

Ecological predictions.

Throughout his work, Foley explains the timing of dispersals by climate changes driving biome shifts, which cause the expansion or contraction of habitat suitable for hominid occupation, and an environmental matching pattern of spread is predicted, as hominids gradually adapted to new conditions. These predictions are fulfilled by the environmental data of the Lower Palaeolithic, but the Aurignacian case study does not show environmental matching within biomes, unless steppe is treated as analogous to tropical grasslands due to the structural similarities between all grasslands (Whittaker 1975). Moreover, Foley predicts movements northwards from Africa during interglacials and spread east to west across Eurasia during glacials, due to the patterns of expansion and contraction of biomes during climate cycles, shown in Figure 3.2. The Lower Palaeolithic data does support the initial occupation of Europe occurring during an interglacial, but the Aurignacian arrives during a mild episode within the last glaciation, contrary to Foley's model if the source of the Aurignacian groups was in Africa as Foley argues, since movement across the enlarged Sahara barrier during glacials should have been impossible. Foley also suggests that the movement of hominids in the Lower Palaeolithic was associated with the appearance of large social carnivores in the European community. There is tentative support for this proposal from the relatively high levels of FADs of carnivores during the late Early and middle Middle Pleistocene. However, as the number of carnivore FADs in each period included the appearance of solitary carnivores such as the cats, the data do not clearly support or disprove Foley's model, and further analysis using both FADs and social groupings would be necessary to establish whether the appearance of hominids in Europe did coincide with the arrival of a significant number of other social carnivores.

Archaeological predictions.

Foley predicts that technologies are directly correlated to hominid species, which is refuted by the Lower Palaeolithic data, and although not directly tested in the Aurignacian case study, the transitional Upper Palaeolithic industries of the final Neanderthals counter the possibility that mode 4 technology is exclusively possessed by *Homo sapiens*. Foley expects there to be gradual developments in hominid behaviour, with no rapid episodes of change. This is supported by the lack of innovation in the Lower Palaeolithic assemblage data, although the loss of Acheulean technology could be seen as a discontinuity. The Aurignacian does not display a gradual development and its innovative artefacts demonstrate that rapid changes were possible, thus technological continuity is not proven. Foley attempts to link the Aurignacian with the movement of *Homo sapiens* from Africa, suggesting an origin for this techno-complex *en route* in North Africa. However, the Aurignacian data clearly shows that the earliest dates of this industry are in Europe, with a later appearance in the Levant. Foley denies the possibility of developments within Europe, consistently placing the origins of technologies in Africa. The mode 3 hypothesis (Foley and Lahr 1997) claims that the origin of prepared core technologies was in Africa, and that no evidence of core preparation should be found in Europe before OIS 7. The European Lower Palaeolithic assemblages include prepared cores from the early Middle Pleistocene, denying the possibility that the development of the Middle Palaeolithic in Europe was the result of the movement of *Homo helmei* from Africa with this technology.

Foley argues that the causes of hominid dispersal were population increase and territoriality, combined with the biological invader traits of generalism, opportunism and behavioural flexibility. There is little evidence to support the argument of population increase driving hominids into Europe, as the surrounding regions show low levels of occupation in terms of the number of sites present. There is a large number of large sites in the Levant during the late Early Pleistocene, providing a potential area of population pressure, but no wave front of population increase driving forwards motion is observed across Europe. Likewise, in the Upper Palaeolithic the numbers and sizes of sites in the surrounding areas of Europe are not particularly high. A possible archaeological proxy of territoriality is raw material transfer distances, which do show that interactions occurred over a limited range in the Lower Palaeolithic, but the long transfer distances of the Aurignacian reject this mechanism of dispersal for *Homo sapiens* entering Europe. The wide dietary breadth predicted by Foley was tested through the numbers of utilised species, which did show a consistently broad range during the Aurignacian, but lower diversity in the Lower Palaeolithic. However, as faunal utilisation data was not widely available these findings are provisionary and do not clearly refute or support Foley's claims. Opportunism and behavioural flexibility may be reflected in the variations within the tool assemblages and the range of environments occupied by the hominid groups. The Lower Palaeolithic shows technological stasis and a slow diversification of environments and landscapes occupied, suggesting low levels of flexibility during the initial occupation of Europe, with more diverse behaviours in the middle and late Middle Pleistocene. The Aurignacian does reveal variance in assemblage characteristics, but a restricted range of environments and landscapes were occupied through its duration, suggesting some flexibility. Thus, the evidence of hominid groups spreading as a result of these physical adaptations is equivocal.

Rolland's model.

Rolland's model specifically applies to the initial occupation of Europe, and the Aurignacian data do not fit his predictions.

Ecological predictions.

Rolland advocates an environmental matching model of dispersal, with slow adaptation to new habitats, environmental change driving movement and the presence of an ecological barrier to hominid occupation at roughly 40° latitude. These predictions are endorsed by the Lower Palaeolithic data, which shows a sequence of movement into novel biomes, later occupation of central and northern Europe than the Mediterranean, and fluctuating evidence of occupation during glacial-interglacial cycles. Rolland also proposes that steppic environments were occupied during OIS 9, which is partially supported by the environmental findings, as temperate grasslands had been occupied before this date, but movement into Northeast Europe took place during either OIS 11 or 9, upholding the argument that harsher and more uniform environments were occupied at this time.

Rolland argues that hominid arrival should be seen through repercussions in the faunal community of Europe. The evidence of the FADs and LADs does show that turnover and community restructuring were happening during the periods of potential hominid dispersal, although it is not possible to tell whether these preceded or followed the arrival of the hominids at the present level of dating resolution. Rolland also predicts that hominids moved during a major faunal dispersal event, and should arrive in Europe at the same time as other species from the same origin. Dispersal of African fauna to Europe occurred during the Early Pleistocene and movement of Asian species during the early Middle Pleistocene. Thus, there is some support for Rolland's linkage of hominid dispersal with the range shifts of other species, although he favoured an Asian origin of the earlier movement and an African source of the later population, the opposite of that implied by the findings of the faunal data. Moreover, the timing of faunal turnover does not prove that hominids shared an origin and route of dispersal with the other species arriving in Europe.

Archaeological predictions.

Rolland forwards a model of gradual behavioural change, with technological variation being environmentally driven, and regional behaviours developing over time allowing the history of populations to be traced. These suggestions are not well supported by the Lower Palaeolithic data. No relationship was found between artefact types and the environments in which they were produced; thus, technological variation cannot be environmentally driven. Lower Palaeolithic technology does change very gradually, with the addition of handaxes and cleavers, and later prepared cores during the Middle Pleistocene in Europe. However, regional behaviours do not seem to have developed during the Lower Palaeolithic, as no unique artefact types were limited to a region, and the variance between areas can be accounted for by the length of time of hominid presence and the size of sites in the region. Therefore, the claim that technological similarities can be used to trace populations is not clearly upheld by the data, because the spatial and temporal differences in artefact occurrences can be explained by dispersal processes rather than population history, as technological narrowing can occur during a movement without environmental pressure. Nevertheless, Rolland's assertion that a pre-handaxe phase existed in Europe, and that the appearance of the Acheulean represented a second movement, is supported by the data. The earliest sites in Europe all lack handaxes, and the timing of the appearance of the Acheulean coincides with ecological opportunities for successful establishment of a new species, although the environmental and landscape data suggest that the indigenous population adapted to conditions in Europe and expanded. Moreover, it is possible that the pre-handaxe industries could represent the exploration before major colonisation proposed by Rolland, supported by the small assemblage size and widely dispersed population during the initial occupation of Europe. It is plausible that the earliest inhabitants of Europe failed to become established as suggested by Rolland, and a second dispersal led to the later settlement in the late Early or early Middle Pleistocene, as sites are lacking in the middle Early Pleistocene.

Rolland backs an origin of the pre-handaxe phase inhabitants of Europe in either North Africa or the Far East. An Asian origin is not supported by a faunal dispersal event, as the FADs data shows that few Asian species appeared in Europe during the Early Pleistocene, whereas African arrivals were present. However, this does not necessarily prove that Rolland's favoured route across the Straits of Gibraltar was the taken, as spread from Western Asia through Eastern Europe is plausible. Rolland focuses on the physical barriers preventing occupation of Europe, especially the mountains and highlands of Anatolia and the Near East. However, occupation of mountains and high plateaux was seen since the middle Middle Pleistocene, thus these landscapes were not barriers to the spread of populations in the potential dispersal associated with the colonisation of northern Europe and the marked rise in numbers of sites at this time. The earlier populations do seem to have been constrained to inhabit river valleys, coasts or lacustrine landscapes. However, this does not provide clear support for the sea-crossings Rolland proposes, only for coastal occupation. Thus, there is little evidence to support either of Rolland's favoured routes and a Levantine source for the pre-Acheulean and Acheulean occupation of Europe is possible.

Carbonell's model.

The Lower Palaeolithic.

Carbonell supports a separate dispersal of pre-Acheulean and Acheulean groups. The pre-Acheulean movement is argued to have entered Europe at around 1.0 Mya from Africa via the Levant, and to have been continuous and widespread since this date. The settlement of Europe at 1.0 Mya is suggested to have been facilitated by faunal turnover and environmental change. The Lower Palaeolithic data supports the pre-Acheulean phase of occupation of Europe, but places its beginning earlier in the Early

Pleistocene. However, the data contradict Carbonell's model as there is a possibility that discontinuity occurred in the middle Early Pleistocene, and the population was focused in the southwest of Europe, unless all the unlikely sites during the Early Pleistocene are accepted, which would show a relatively widespread occupation. Furthermore, the widespread dispersal of the pre-Acheulean groups is argued to be allowed by a lack of barriers to movement into and within Europe, which is refuted by the lack of early sites in mountains and highlands, and in many biomes. The context of faunal turnover allowing colonisation is supported by the data, since hominid groups appear at times of high levels of FADs and LADs. Carbonell recently modified his dispersal scenario of the pre-Acheulean population to include the limited distribution of these groups in the southwest, as shown in the data, but argues for an Asian origin. The route into Europe and the area of origin of the population, and the possibility of return migration to Africa was not definitively revealed in the Lower Palaeolithic data of artefact distributions, site distributions over time or faunal correlations; thus, this aspect of Carbonell's model cannot be accepted or rejected at present.

The pre-Acheulean phase in Europe is described as behaviourally primitive, with high mobility and expedience compared to the Acheulean territoriality and planning. Carbonell suggests that the pre-Acheulean phase will show differences in raw material transportation, subsistence and assemblage sizes compared to the Acheulean. The Lower Palaeolithic data revealed a very weak trend for assemblage size to increase over time and raw material transfer distances to decrease, providing slight support for the contention that the pre-Acheulean sites were smaller than the Acheulean assemblages and were characterised by less territoriality. The faunal utilisation data did not show any trends over time and thus there is no evidence of subsistence differences between the pre-Acheulean and Acheulean groups. Therefore, there is no strong supporting evidence for Carbonell's model of competition based on territoriality and subsistence organisation driving the spread of the pre-Acheulean and Acheulean groups.

The Acheulean is argued to disperse from Africa at 600 Kyr BP due to population increase without environmental opportunities for movement, except the low sea level of OIS 14 that allowed a route across the Straits of Gibraltar. The evidence of numbers of sites and artefact types do show a substantial change in the middle Middle Pleistocene, fitting the dating proposed by Carbonell, although it is not certain that these changes represent a second dispersal into Europe instead of indigenous population increase and diversification of behaviours. There is little evidence in the areas surrounding Europe that population increase took place and drove dispersal, as the number and size of sites in the middle and late Middle Pleistocene is greater in Europe than in its surrounding areas. Furthermore, dispersal at 600 Kyr BP would be facilitated by faunal turnover and environmental changes during glacial-interglacial cycles, undermining Carbonell's demographic explanation. The issue of the origin and route of the movement was not resolved by the data.

The Aurignacian.

Carbonell's argument that the Aurignacian does not show unity across Europe due to high levels of regional variance is not supported by the artefact data, which showed temporal trends but little spatial patterning, and a division into only eastern and western groups. However, Carbonell's assertion that the Aurignacian developed in Europe as a result of the meeting of anatomically modern humans and Neanderthals could be endorsed by the Aurignacian case study, as the earliest Aurignacian sites are located in Europe, not the Near East or Africa. The fossil record is insufficient to test the claim that the Aurignacian is not necessarily associated with *Homo sapiens* and could be a Neanderthal industry. The Aurignacian data also cannot address Carbonell's claim that the Aurignacian and Mousterian were differentiated by ecology, as Mousterian sites were not included in the study.

The applicability of the interpretive framework.

The models discussed in Chapter 2, deriving from the observations of ecological, sociological and geographical research will be examined in the light of the data concerning the two study periods. The aspects of the framework of interpretation of movement processes that was developed from these models, which have been supported by the data analysis will be disclosed, and the value of the interpretive framework will be appraised.

The biological models.

Biological invasions.

The predicted circumstances surrounding a biological invasion suggest that there should be environmental matching between the origin and the destination, and that environments should be occupied in their order of similarity to the original habitat. These conditions are satisfied in the Lower Palaeolithic data, with the grassland, shrubland and woodland habitats being occupied before temperate forests, alpine grasslands and taiga, which would have been less familiar to groups moving into Europe from the south. However, in the Aurignacian no sequence of environmental occupation is seen, although the grasslands are the main habitat to be inhabited. Stable environmental conditions at the destination allow a biological invader to adjust to the new region occupied without problems of fluctuating resources. The climate and environments of OIS 3 were highly unstable (van Andel 2003; Huntley *et al.* 2003), undermining the possibility that the Aurignacian movement conformed to a biological invasion model. The environment of Europe during the Early Pleistocene and early Middle Pleistocene was probably more stable than that of OIS 3 (Gamble 1995a; Agusti *et al.* 2001), especially at the temporal scale of hominid lifespan, which would be the time frame of adaptation necessary to survive and establish a population. Therefore, the initial occupation of Europe fits the environmental predictions of a biological invasion, but the Aurignacian may not.

Biological invasions are expected to occur in a context of disturbance, extinctions and community restructuring resulting in empty niches allowing easier assimilation into the community. The Lower Palaeolithic faunal data provides strong support for a context of movement during periods of faunal turnover, whereas the Upper Palaeolithic data gave no direct support for the presence of empty niches, although some species were declining and possibly leaving niches open in areas of Europe (Stewart *et al.* 2003a). Biological invasions are also anticipated to transpire in regions of endemic fauna that have not evolved means to resist the arrival of new competitors. The Lower Palaeolithic data do not suggest high levels of endemic fauna, as African and Asian species were present, particularly in the Early Pleistocene. The OIS 3 fauna did include endemic species in Europe, but these were located in the southern

European peninsulas (Stewart *et al.* 2003b) where the Aurignacian occurred at low densities or was entirely absent. Thus, there is little evidence to connect either of the periods of population movement to the exploitation of endemic weakly resistant communities.

The population size of a biological invasion is predicted to be large enough to be self-sustaining, and to increase rapidly after a lag time, until saturation is achieved. The Lower Palaeolithic data concerning population size suggests that initially numbers in Europe were very small and remained steadily low in the Early Pleistocene, which could represent the lag time, followed by exponential increase during the Middle Pleistocene. Thus, the data do not support strong propagule pressure at the start of the dispersal, but does follow the predicted patterns of population increase. The Upper Palaeolithic data show that a large population was present in Europe from the earliest dated occurrences of the Aurignacian, and the population size seems to have increased slowly, without a lag time, and thus does not match the predicted demographic expansion. These demographic expectations are linked to the two-phase model of a small low-density population preceding expansion and substantial demographic increases. The Lower Palaeolithic data show reasonable support for a two-phase movement, with initial small population and reduced technologies, followed by expansion and an increased range of behaviours indicated by the production of handaxes and cleavers. The spatial patterns of tool occurrences show a lag effect between the time of appearance of hominids in a region and the manufacture of handaxes and cleavers, strongly supporting the two-phase model. The Upper Palaeolithic data lacks the low-density phase, and unless the small and undiagnostic EUP assemblages are treated as Aurignacian exploration, no behavioural evidence of a two-phase movement is seen. Failure to establish during the initial small population phase is also predicted, and may be seen in the Lower Palaeolithic lack of definitely dated sites in the middle Early Pleistocene. There is no evidence of the Aurignacian failing to establish before reaching the expansion phase.

Biological invasions have been associated with behavioural innovation or narrowing and physical changes among the dispersing population. Behavioural narrowing may be supported by the Lower Palaeolithic evidence that handaxes and cleavers were not manufactured by the earliest groups in Europe, whereas the populations in the surrounding regions did use these tools. The Upper Palaeolithic data does not suggest that behavioural narrowing happened, unless the undiagnostic small EUP assemblages were formed by Aurignacian groups undertaking a limited range of activities. Innovation is not detected in the Lower Palaeolithic artefact data, but the Aurignacian does show the addition of new types of artefacts and the regional occurrence of certain forms, which indicates that new behaviours were being adopted by the groups moving across Europe. Dietary breadth is predicted to increase or decrease as a response to new conditions encountered and the behavioural changes they engender, but no evidence of this was detected in either the Lower or Upper Palaeolithic data. Physical changes were not directly investigated, but the evidence of changing hominid species over time during the Lower Palaeolithic can be interpreted as physical responses to the European environment (Stringer and Hublin 1999; Bermúdez de Castro *et al.* 2004). The fossil record of the Aurignacian is extremely sparse, but these groups are considered to be anatomically modern humans and did not undergo substantial physical adaptations after arriving in Europe (Stringer 2002).

The spatial patterns of movement predicted to occur during a biological movement are that patches of suitable habitat will be colonised on the edge of the primary population, but satellite populations far beyond this front may also form. Thus, the majority of dispersals are short distance but longer movements are possible. The slow spread of the Lower Palaeolithic population across Europe suggests that movements were short, whereas the Aurignacian appearance across large areas of Europe simultaneously indicates that long distance movements to satellite populations must have occurred if the movement was a biological invasion. The focus of Aurignacian population in clusters could also support the patch colonisation model. Likewise, clustering of sites is seen in the Lower Palaeolithic data; hence, the earliest occupation of Europe appears to have taken place by short distance dispersal to patches of suitable resources, rather than the long distance movements to secondary dispersal centres seen in the Aurignacian. The maintenance of links to the parent population enhances the chance of a successful biological invasion, which may be seen through spatial continuity of occupation and behavioural stability. The appearance of the Lower Palaeolithic in southwestern Europe does not provide spatially continuous occupation between the potential source areas and the European sites. Moreover, the abandonment of the manufacture of handaxes could be interpreted as a breakdown of the behaviours of the parent population, and thus isolation of the European population. The Aurignacian also appears to be isolated in Europe, although areas of western Asia did contain Upper Palaeolithic industries that may have been connected to the emergence of the Aurignacian (Tixier and Inizan 1981; Gilead 1981; Banesz 1998; Kuhn *et al.* 1999; Kuhn *et al.* 2001). However, as the geographical origin of the Aurignacian is uncertain, and the distinctive features of the techno-complex are not seen outside Europe until after its appearance within Europe, spatial and behavioural continuity between the parent population and the Aurignacian cannot be proven.

Biological invaders are usually generalists, with high levels of behavioural flexibility and strong competitive ability. All members of the genus *Homo* are generalists (Potts 1998), with an omnivorous diet, and thus both the Lower and Upper Palaeolithic movements could conform to the biological invasion model. Behavioural flexibility was not directly assessed, but competitive ability was measured through the levels of competitors present in archaeological sites. The data from both study periods showed that carnivores and omnivores were present at consistently low levels throughout the dispersal; hence, strong competitive ability was not demonstrated.

Jump dispersal.

This model predicts that movement will cross a substantial barrier, resulting in isolation of the dispersing population, and potential founder effects leading to physical change. The Upper Palaeolithic movement does not show any of these features. The Lower Palaeolithic dispersal may have crossed the barrier of the Straits of Gibraltar, and may have been followed by physical adaptation and speciation resulting in *Homo heidelbergensis* and ultimately *Homo neanderthalensis*. Moreover, as settlement of Eastern Europe appears to have occurred later than in the west, isolation may have occurred after a movement from the east.

Secular migration.

Slow movements associated with evolutionary and behavioural change in the context of environmental changes are predicted in this model. The rapid Upper Palaeolithic dispersal, without resulting physical adaptations, cannot be accommodated in this model. The Lower Palaeolithic movement was slow, possibly involving evolutionary change, and hence could be considered as a secular migration. However, it is unclear that substantial behavioural changes occurred during the spread of the Lower Palaeolithic; thus, not all of the criteria of this model are fully supported by the evidence.

Diffusion.

This model involves many of the features seen in a biological invasion, such as the dominance of short distance moves, population increase, physical adaptation, behavioural changes, environmental matching and community restructuring. Additionally, diffusion stipulates that a single metapopulation gradually expands in a wave front advance through corridors or filters but not barriers. The presence of corridors or filters and absence of barriers is unclear from the evidence of both study periods, as the route of dispersal is uncertain. However, the slow spread of the Lower Palaeolithic implies that short distance movement in a wave front may have taken place. The static nature of the Lower Palaeolithic assemblages prevent conclusions being drawn concerning the presence or absence of a single metapopulation from a shared behavioural repertoire, and the fossil evidence is too limited to determine whether groups became isolated and underwent independent evolution. The Upper Palaeolithic spread rapidly, perhaps by satellite populations forming beyond the wave front, thus diffusion is not an appropriate model for this movement. Nevertheless, the unified artefact forms of the Aurignacian suggest that a single metapopulation was maintained throughout its existence. Diffusion is predicted to occur in the context of a movement of several species from the same region. The Lower Palaeolithic faunal data does show movements of species into Europe from Africa and Asia during the periods of hominid arrival, whereas the Upper Palaeolithic fauna had no arrivals in Europe apart from *Homo sapiens*. Diffusion is also associated with environmental change and biome shifts, which occurred throughout the Pleistocene in Europe and thus apply to both the periods of movement.

The sociological and geographical models.

Local and step migration.

Local and step migrations are short distance movements, occurring within the existing social network without requiring behavioural change. These movements may result in long distance movements as the cumulative effect of a series of shorter migrations, but do not cause the formation of destination nodes because knowledge of the local destinations is widely available. Step and local migration may involve a representative sample of individuals from the original community. The slow spread of the Lower Palaeolithic across Europe, with its cline of dates of first appearance, and lack of evidence for behavioural change, could conform to these processes. However, the loss of handaxes and cleavers from the areas undergoing settlement during the spread of the Lower Palaeolithic does not fit these expectations, since slow movement within the social network should not result in technological loss. Furthermore, clusters of sites are present during the Lower Palaeolithic, which undermines the expectations of a lack of destination nodes. The rapid and seemingly focused movement of the Upper Palaeolithic does not fit these models, although the lack of a clear exploration phase before major settlement would be accommodated in a step or local migration scenario.

Circular and chain migration.

These models of migration involve long distance as well as short distance movement, focused towards destination nodes due to the limited knowledge of conditions at a distance. Movement is initially expected to comprise a small sub-set of the original community, and behaviours are predicted to be limited. Over time a flow of migrants will develop, involving a broad range of individuals and a greater variety of behaviours. The clustering of population into nodes is seen in both study periods, but the two-stage movement is only clearly identified in the Lower Palaeolithic through the limited technology of the earliest sites, and the small population size of the initial groups. Nevertheless, exploration may have occurred in the Upper Palaeolithic in the form of the undiagnostic EUP sites, with the Aurignacian representing the second phase of more substantial movement, which is supported by the large population size indicated by the numbers of sites during the earliest phase of the Aurignacian. The long distance movements predicted by these models allow rapid colonisation, which is seen in the Aurignacian example but not in the Lower Palaeolithic. However, the focus on destination nodes results in intervening areas being ignored by the migrants in favour of known but distant destinations. This situation may be seen in the Lower Palaeolithic, if the eastern route into Europe was used, as the vast majority of sites from the earliest dates are in the west. Return movements are also predicted by these models, and possibly explain the late appearance of the Aurignacian in the Levant. There is no clear evidence of a return migration during the Lower Palaeolithic, but this may be due to the limited variety of tool forms disguising movements.

General characteristics of human migrations.

In addition to the predictions of step, local, chain and circular migration models, observations suggest that migrants usually move within an existing social network and act to reinforce their ethnic identity. Possible evidence of this process is seen in the Aurignacian production of mobilary art and personal ornamentation during the early stages of the movement, and the unified artefact forms throughout the Aurignacian techno-complex. There is little evidence of this process operating in the Lower Palaeolithic, unless the production of handaxes is interpreted as an expression of ethnicity.

Migrants have also been observed to be drawn from the skilled young adults in the original community, and therefore to be innovative and behaviourally flexible. Innovation is not observed in the Lower Palaeolithic data, but the Aurignacian does show evidence of the development of new artefact types. Stagnation at the origin of the migration, compared to dynamism in the destination areas has also been observed, due to the movement of the most skilled and innovative members of the community. It is possible that the Aurignacian represents such dynamism at the destination, whilst in western Asia the development of distinctive and innovative artefacts was slower. A lack of change is seen throughout the Lower Palaeolithic, refuting the existence of these processes.

Which models apply to the two study periods?

None of the archaeological models is supported in its entirety by the findings of this study. Gamble's social approach can only partially account for the events of each of the study periods, and his environmental model of the 1980s is likewise supported by some of the data but rejected by other data sources. Foley's ecological approach is well supported by the Lower Palaeolithic data but not by that of the Aurignacian, and his archaeological predictions are not upheld for either study period. Rolland's linkage of hominid movements and biogeographical events is validated by the faunal data, but his suggested routes of colonisation and connections between technology, environment and population history are not supported. Carbonell's model of competition driving movement receives little support from the study, although his focus on the existence of a pre-Acheulean phase does seem to be justified. Likewise, Carbonell's suggestion that the Aurignacian emerged within Europe could be backed by the data, but his proposal that major differences exist between the assemblages of the regions of Europe is not endorsed by the findings. Thus, each archaeological model offers an incomplete explanation of the processes that took place during both periods of population movement. However, aspects of each model provide useful insights into these events.

It has often been assumed that the events of the Lower Palaeolithic movement into Europe follow a biological process, whereas the movement of the Aurignacian is explained by cultural models. It is true that the Lower Palaeolithic data better fit an historical biogeographical model than the Aurignacian data do. The slow spread and lack of behavioural change during the Lower Palaeolithic events suggest that a process of diffusion operated. However, many of the predictions of biological invasions are also fulfilled by the Lower Palaeolithic data, providing insights into the processes allowing the diffusion to take place at an ecological scale, particularly the technological loss that occurred in the areas undergoing colonisation, which can be explained by the nature of the groups that explore beyond the population front. Nevertheless, the data also fits the local or step migration models in the rate of spread, and the chain or circular migration models in the presence of a two-stage process of movement. Therefore, although the events of the Lower Palaeolithic are well explained by a combination of ecological and historical biogeographical approaches, an element of sociological or human geographical processes cannot be dismissed in the explanation of these events.

The movement of the Aurignacian, with its rapid spread and nodal destinations, fits the chain migration model, although the lack of an exploratory stage undermines the certainty of this process. Nevertheless, the lack of the exploratory phase can probably be explained by the poor dating resolution in relation to the speed of the processes under investigation. However, a biological invasion with the formation of satellite populations far beyond the primary population would also accommodate the patterns in the Aurignacian data. The historical biogeographical and the step or local migration models do not match the findings of the Aurignacian data. It is currently impossible to differentiate between the two possible sets of processes that operated during the Aurignacian movement, as the archaeological proxies of both models predict the same findings. Therefore, the movement of the Aurignacian can equally plausibly be explained by biological or cultural processes.

Conclusions.

In conclusion, the findings of the case studies show that is it possible to detect some of the processes predicted in the models of population movements. The archaeological approaches to the episodes of movement have addressed some of these processes, but each model provided only a partial explanation of the events of each movement. The ecological, sociological and geographical models likewise supply insights into the processes that occurred, but none perfectly matches the findings of the data analysed. The strength of these findings and their potential contribution to the study of population movements during the Pleistocene will be discussed in the following chapter.

Chapter 12 : Conclusions.

Achievements of the interpretive framework developed in the study.

This study aimed to determine whether it is possible to discern the processes that occurred during the population movements into Pleistocene Europe. The published archaeological record was used in order to test whether the current state of knowledge of Pleistocene Europe allows the behaviours underlying movement to be detected, rather than simply providing a timetable of dispersal events. The models of movements developed by academic disciplines other than archaeology were used to provide a framework of interpretation, allowing access to the processes taking place during the movements under investigation. The predictions of these models have been shown to be present in the archaeological, palaeontological and palaeoenvironmental records of the study periods. Therefore, this study has demonstrated that some aspects of the behaviours associated with movement can be seen in the spread of the Lower Palaeolithic and the Aurignacian.

Archaeological models were also investigated in order to see whether the current approaches to population movements are justified. The archaeological models were partially upheld by the findings of the analysis, but none were totally supported. Each of the models was strongly agenda driven; Gamble aims to show that social behaviour is the key to understanding all the events of prehistory, whereas Foley intends to explain all patterns by ecological adaptation and Neo-Darwinian theories. Carbonell follows a political agenda of showing Iberia and particularly his own excavations to be key to human evolution. Rolland has built a responsive model, which changes as new data are discovered, but his underlying biogeographical framework and assumption that assemblage characteristics can trace population history is constantly present, and the promotion of this interpretive method is his agenda. The findings of this study support aspects of each author's models, but also show that a single focus of interpretation, whether ecological, social, biogeographical or political, cannot explain all the archaeological remains of the population movements. The issues highlighted in the sociological and geographical models, such as decision making, information flow, knowledge acquisition and expression of identity are important aspects of movements, and can be seen in the Palaeolithic archaeological record, as focused directional movement and strong expressions of identity during the Aurignacian, and exploration during the Lower Palaeolithic. Both periods also show strong ecological preferences and the Lower Palaeolithic reveals a sequence of environmental adaptations. Thus, each period of movement can be seen to possess ecological and social aspects, and requires interpretation in the light of all the possible processes that operated. Therefore, the aim of this study to search for an interpretive framework based on both ecological and sociological knowledge has been justified, and has provided a more complete means of understanding the happenings of the movements into Europe during the Pleistocene.

Palaeolithic archaeology has tended to assume that ecological and biogeographical models are appropriate to the interpretation of human behaviour in the Pleistocene, especially during the Lower Palaeolithic. Thus, the ecological and biogeographical aspects of the archaeological models were well supported by the data, as historically these issues have been of interest to Palaeolithic archaeologists and have been well researched. However, sociological and geographical models of movement have not been adopted in the investigation of these issues, as the environmental and evolutionary background to the movements has been given precedence over issues of the social behaviours of the groups experiencing movement, even during the Upper Palaeolithic. The archaeological models that do consider social aspects of movement have not made use of the research of sociology and human geography concerning the processes of movement occurring among human groups in the present, and therefore the social predictions of the archaeological models did not always coincide with the models of human migration developed by other academic disciplines from observations of migrations. Archaeology has often assumed that behavioural change is linear, and assemblage characteristics can be used to trace population history, whereas sociological studies of migrants have shown their material culture to be highly flexible and expressions of identity to be variable between the parent population and the migrants. Thus, the means of detecting migration flows used by archaeology cannot be retained, and the predictions of sociological and geographical models must be considered in future studies of population movements throughout prehistory.

It has often been assumed in Palaeolithic archaeology that the events of the Lower Palaeolithic are entirely explained by ecological and evolutionary processes, whereas the Upper Palaeolithic requires some social or cultural interpretation. This study intended to determine whether it is justifiable to apply biogeographical models to the initial occupation of Europe, and models based on information sharing within regional social groups to the Upper Palaeolithic. However, the models of biogeography and sociology and human geography resulted in similar predictions in the patterns anticipated to be present in the proxy data sources. Therefore, it is not possible to confirm that Lower Palaeolithic movements were more biologically based than those of the Aurignacian. Nevertheless, the models can be divided into those treating slow local movements producing spread in a wave front pattern over long periods of time, and those that model rapid spread to nodal locations far from the source, and the differences between the two study periods can be seen in this framework. The Aurignacian appears to have moved rapidly, whether due to processes of a biological invasion or a chain migration; whereas the Lower Palaeolithic movements were slower, conforming to a local or step migration or a biogeographical diffusion. However, differences were also detected within the periods of potential movement in the Lower Palaeolithic, as a context of movement during a faunal dispersal was present during the arrival of the earliest occupants of Europe, but not the appearance of the Acheulean. Therefore, the Lower Palaeolithic events should not be treated as unitary, the context of movement was variable, and the behaviours surrounding these episodes were potentially different. The traditional archaeological assumption that the Lower Palaeolithic was invariant and unchanging is thus challenged by these findings, and each episode should be investigated separately, rather than assuming that a single model can explain all events prior to the emergence of the Upper Palaeolithic.

The differences between the archaeological models of the events of the Lower Palaeolithic and the Aurignacian can be linked to the belief that the detection of social processes requires high resolution data that is assumed to not be available at the timescale of the Lower Palaeolithic. The data analysis was intended to reveal whether it is true that processes can be identified in the Upper Palaeolithic but not during the earlier movements. It was found that the rapid movement of the Aurignacian, combined with the high level of uncertainty of radiocarbon dates at this time depth, prevented the detection of many of the processes that might have occurred, particularly an exploratory phase. In contrast, the slow spread of the Lower Palaeolithic allowed the detection of exploration through the spatial distribution of sites despite problems with dating. However, the more variable archaeological record of the Aurignacian, compared to the Lower Palaeolithic, did enable issues of regional social networks and expression of identity to be discussed, whereas the static nature of the Lower Palaeolithic prevented their detection. Nevertheless, the temporal sequence of environmental and landscape occupation in the Lower Palaeolithic provided insights into the possible problems of adaptation and knowledge acquisition during movements, which were not possible to detect in the Aurignacian data because the initial phase of movement and exploration could not be accessed. Therefore, the assumption that the Upper Palaeolithic data would be of better quality than the Lower Palaeolithic proved to be false, and the possibility of identifying processes of movement is present in the data of both case studies.

The interpretive framework allowed the resolution of several puzzles left unexplained in the archaeological models of the initial dispersal of hominids into Europe. The very low numbers of sites in Europe before the middle Middle Pleistocene indicates an extremely small population, which in turn suggests that the population might not be demographically self-sustaining. However, failure to increase population and to become established is a common feature of ecological spread, and hence it is not surprising that an early phase of limited incursions into Europe, which subsequently failed took place. Moreover, repeated or semi-continuous dispersal is anticipated, and the initial groups in Europe could conform to a sink population relying on reinforcement from further movements from the source population. Therefore, the argument followed by proponents of the short chronology that a lack of evidence of continuous occupation of Europe before OIS 13 indicates that colonisation did not take place before this date is falsified by the interpretive framework of this study, as multiple dispersals and failure before establishment have been shown in ecological studies to be normal features of spread.

Furthermore, the interpretive framework can resolve the problem of the early concentration of sites in the southwest of Europe, which has been assumed in many archaeological approaches, to require a crossing of the Straits of Gibraltar (Rolland

1978; Giles Pacheco and Pérez 1987; Straus 2001). Rapid movement through areas of sub-optimal habitat, followed by occupation and population increase in optimal areas can result in a picture of earliest occupation of an area at a point far from the entrance to the region (Hazelwood and Steele 2003, 2004). Moreover, the groups undertaking the initial movement are predicted to be small and highly mobile, and to use a restricted technology; thus, the evidence of these groups in the regions crossed before settlement is liable to be dismissed by archaeologists as not clearly of human manufacture. These early ephemeral sites have been shown to lack handaxes and cleavers, which appear in each region after a substantial length of occupation. The late appearance of handaxes in Europe compared to its surrounding regions has been highlighted as a problem in several studies (Rolland 1992, 1998b, 2001; Carbonell *et al.* 1999b). However, the interpretive framework suggests that a narrowing of technology is to be expected during movement, followed by a broadening. Thus, the appearance of handaxes in a region may signal a more substantial occupation following exploration.

Recommendations for future studies.

In general, the proxy sources of data concerning movement did provide good evidence of the processes under investigation. However, the analysis was hampered by the lack of published data concerning many of the variables, even including the location of the sites. Many sites lack a full report, and interim publications tend to focus on a single aspect of interest to the excavator, rather than providing an overview of the features present. There is a strong regional bias to the quality of publication, with British sites being reported on far more fully than those in continental Europe. Admittedly, environmental proxies and raw material provenancing is not available for all sites; however, given the current state of publication of archaeological materials it is not possible to determine whether data is simply unpublished or unobtainable for many sites. Thus, it is not possible to dismiss the proxy sources of data that did not provide good results, the raw material transfer distances and faunal species showing utilisation, as their lack of patterning may be explained by poor recording rather than a genuine absence. Therefore, better publication, including information concerning the surroundings of the site, as well as stratigraphy and assemblage characteristics, would greatly facilitate studies of population movements, and other regional syntheses.

The publication of the faunal assemblages of archaeological sites was of particular concern because the overwhelming majority of reports focused on issues of interest to the palaeontologists that examined the assemblage, such as taxonomy and environmental reconstruction, without any mention of archaeological questions of evidence of hominid consumption of meat or marrow, or of modifications to the bones to make tools. There is clearly a need for greater integration between the disciplines involved in the study of the European Pleistocene, in order to maximise the information to be gained from all aspects of the archaeological and palaeontological records. This is especially applicable to the Lower Palaeolithic sites, as a context of faunal dispersal was found to occur during the initial hominid movements, and thus the interaction of hominids with other members of the ecological community may have been extremely important in the nature of the movements, but cannot be determined on a European scale given the poor publication of the fauna from many sites.

Nevertheless, other data sources were found to be strong sources of information regarding movement processes. The spatial and temporal distribution of sites revealed the rate of spread, exploration and potentially communication during movements in both study periods. The dates and locations of sites should be widely available, and therefore should be considered in future studies of movement, in both the Palaeolithic and later periods. Population size over time can disclose the rate of increase, and is related to the rate and nature of spread, thus the number and size of sites should be included in considerations of movement processes as proxies for population size. The environment surrounding the sites has been found to provide useful information regarding the processes of adaptation to new regions, the capacities of the hominids to cope with unfamiliar conditions, and also the ecological preferences of the groups involved in movement. Landscape has likewise been found to be a major determinant of the ease of colonisation because its features are linked to the acquisition of knowledge about an area, and can impact upon the ability of hominids to locate vital resources and other individuals or groups. The features of interest in the landscapes surrounding sites are the presence of a water supply and a natural corridor or topographic features that enable paths and landmarks to be identified. Therefore, reconstructed landscape features should be recorded in more detail in archaeological publications whenever possible, rather than simply labelling sites as open-air or cave/abri, as a description of the local area in terms of the presence or absence of rivers, coasts, mountains, plains, hills and plateaux would be more useful, and would enable archaeologists to address questions of hominid knowledge acquisition and landscape utilisation that previously have been unobtainable.

Previous approaches to the use of tool forms in periods of movement focused on the tracing of the origin and route of movement. The framework of analysis developed from the findings of sociological and human geographical studies undermined the potential of lithic assemblages to directly reflect population history, but have shown that changes in assemblage characteristics are to be expected during movement. The appearance of new forms, or loss of technologies, has been found to be more informative than similarities between assemblages. Movement is also associated with the appearance of novel artefact forms and the strong expression of identity through material culture; thus, movements may be seen through the emergence of widespread similar assemblages with new forms of technology and style, but little similarity to the assemblages at the origin of the movement. Therefore, tracing the source of movements through the archaeological record remains problematic, but it may be possible to detect periods of movement in the destinations by the use of lithic assemblages, in conjunction with the other proxy data sources for movement.

Furthermore, the prediction that the initial phase of a movement will entail small groups exploring over large distances, and possibly using a restricted material culture has repercussions for the criteria used to validate the earliest archaeological sites in Europe. Sites pre-dating major occupation of Europe in the middle Middle Pleistocene, which have small assemblage sizes, and lack distinctive artefacts such as handaxes, have often been dismissed as probably not manufactured by hominids. The framework of interpretation built in this study suggests that this rejection of small early sites may have destroyed the potential to detect processes of movement and the timing of the earliest incursions into Europe. Therefore, the criteria used to judge whether an assemblage is genuinely indicative of human presence need to be reassessed in the light of these predictions.

Conclusions.

In conclusion, the processes underlying movements, such as landscape learning, ecological interactions and behavioural innovations have been found to leave traces in the archaeological record. Although it is difficult to determine the precise form of a movement from the archaeological record, movement itself can be seen and some aspects of the behaviours involved can be recovered. Archaeology has traditionally treated issues of environmental tolerances, raw material transportation and ecological interactions as reflecting behavioural capacities of the hominid groups under study, with evolutionary, cognitive and economic explanations of the patterning of the archaeological record. This study has shown that movement and duration of occupation of an area can affect the environments and landscapes occupied, and have repercussions on the artefacts present, and potentially may affect other aspects of the archaeological record, such as raw material transportation and subsistence. Therefore, the history of the population in a region must be considered in the explanation of the behaviours seen in the archaeological record, in conjunction with issues such as raw material availability and behavioural capacities. The framework of interpretation developed in this study allows a means of detecting some processes of movement, but cannot differentiate between many of the models of movement, and cannot prove that movement rather than cognitive developments, adaptations and economics, was the cause of these patterns. Future studies, with the benefit of better dating resolution and enlarged samples of sites, may be able to resolve these difficulties, and develop a means of distinguishing between movements and indigenous development or diffusion of ideas in later periods of prehistory when dispersal is controversial due to the presence of indigenous populations in the region and a lack of clear genetic evidence of the arrival of a new population. Nevertheless, population movement must be treated as an important aspect of behaviour and should be considered in explanations of both Palaeolithic and later periods of archaeology.

Appendix One: Glossary.

Adult range: the range occupied by an individual after dispersal from the natal range and independence from the parental group has been achieved.

Allee effects: low population density effects of fluctuations in sex ratio and age composition.

Anagenesis: evolution within a lineage that results in new species without branching events, thus a species evolves into a single daughter species.

Anarchist: ideology within a narrative that considers cataclysmic change to be possible, which could recreate the utopia of the distant past by rejecting the present society entirely.

Barrier: conditions beyond the tolerance limits of a species, such as adverse temperature, moisture or chemical conditions, or overwhelming competition, predation or a lack of resources.

Bergmann's rule: the correlation between the body size of a species and its latitude.

Biogeography: the study of the geographical distribution of species.

Biological invasion: the expansion of a species range into new territory.

Biome: an area of continuous similar habitat, with a consistent structure and distribution of energy and resources, despite variation in species within the biome.

Biotic barrier: ecological conditions beyond the tolerance limits of a species due to high levels of competition and predation, or insufficient resources.

Biotic release: rapid spread of a species during a biological invasion due to the release from the constraints of co-evolved competitors, predators, parasites and diseases.

Biotic resistance: prevention of a biological invasion through competition, predation, parasitism and disease undermining the ability of the invader to establish a sustainable population.

Centrifugal dispersal: movement away from the centre of population.

Centripetal dispersal: movement towards the core population.

Chain migration: permanent or prolonged movement to distant destinations, involving social upheaval. Movement is focused on known locations after exploration by pioneers, creating a migration network reflecting information flow.

Character displacement: changes in the behaviour and physical traits of a species as a result of niche shifts to differentiate species with similar niches and reduce competition to avoid extinction.

Circular migration: movement to a destination followed by a return to the origin, for example during transhumance and seasonal movement. Movements are to known destinations, over variable distances, and take place within the original social network.

Colonisation: a cultural process of movement of a population into a new territory.

Comedy: plot structure of a narrative in which partial liberation from fate occurs as the hero becomes reconciled to the world, elements are harmonised and conflicts result in positive outcomes, which can produce new forces in the world.

Community restructuring: see ecosystem restructuring.

Conservative: ideology within a narrative that considers change to be undesirable, and to take place at a gradual pace because the current situation is the most desirable state possible.

Contextualist argumentation: form of argument that aims to be integrative within the context and functional interrelationships of events in the plot, but denies the possibility of laws of interpretation. Contextualism is inherently synchronic and the causality proposed is specific to the events under investigation.

Corridor: a link between two areas of similar habitat, acting as a route for interchange of species, and resulting in similar community composition on either side of the corridor. Alternatively, a broad band of continuous habitat, facilitating free dispersal of species throughout a biome.

Cultural distance: the costs of social upheaval of movement into an unfamiliar social environment.

Diffusion: local movement within the parent population during a biological invasion. In historical biogeography diffusion takes place within a corridor or filter, resulting in gradual expansion through areas of suitable habitat.

Dispersal: a biological process of movement of a species into a new territory.

Ecosystem restructuring: changing the organisation of the distribution of energy and niches within an ecosystem.

Emplotment: the structuring of facts into a coherent argument in the form of a story of a familiar kind.

Endemism: areas with high numbers of species that have a restricted geographical range and are unique to the region due to a history of evolutionary isolation.

Environmental matching: the similarities between the ecology of the origin and destination of a biological invasion that facilitate establishment.

Establishment: the founding of a sustainable population over several generations in a new territory.

Filter: a gradient of community composition, which allows some exchange of members of neighbouring communities, but restricts the movement of some species.

Followers: individuals who undertake movement only when the destination is known and the risks of movement are minimised due to the exploration of pioneers.

Formal argument: narrative structure that explains the events of the plot as a process of development following the rules of Formism, Organicism, Mechanism or Contextualism.

Formist argument: mode of argumentation that aims to identify the unique attributes of the objects under discussion by description and classification. Formism does not address causality or diachronic change and involves little generalisation.

Founder effect: changes in the genetics of a founding population, compared to the parent population, due to the small size of the founding group.

Fundamental niche: the area in which a species can potentially survive, limited by physical constraints such as temperature and moisture.

Generalism/generalist: a species that is able to survive a wide range of conditions by having a broad diet and high levels of behavioural flexibility.

Gravity model: spatial interaction model that predicts that the flows of migration between centres of population are proportion to the size of population in each centre.

Holarctic: species with a distribution throughout the Arctic Circle regions of northern Eurasia and North America.

Ideological implications: form of explanatory code of a narrative concerning the placement of utopia relative to the present and the nature of change over time. The ideological stances of academic narratives are Conservative, Liberal, Radical and Anarchist.

Invasional meltdown: breakdown of the ecological community as a biological invasion causes ecosystem restructuring and existing species are forced to change ecological roles by niche shifts, which often results in extinctions.

Irony: linguistic trope that undermines the relationships constructed by the use of Metaphor, Metonymy or Synecdoche. Irony is negational, revealing the problems and limitations of linguistic constructions by the use of absurdities and paradoxes. Irony is associated with Satirical plots, Contextualist argumentation and Liberal ideology.

Jump dispersal: movement over a considerable distance from the main population front of a biological invasion, resulting in the establishment of an independent satellite population. In historical biogeography jump dispersals cross barriers and traverse large distances in a relatively short period of time, within the lifetime of an individual.

K-selection: species adapted to slow reproduction with long generation times, few offspring and high levels of parental care.

Liberal: ideology within a narrative that considers change to occur at the social pace of debate, through acceptable and limited adjustments, which will build on the present situation to produce utopia in the distant future.

Local migration: short distance movement with little or no disruption to the social contacts of the migrant.

Mechanistic argumentation: mode of argument that aims to be integrative and strongly reductive. Events of the plot are seen to be determined by generalised laws of cause and effect. Mechanistic argumentation focuses on the search for ahistorical laws of explanation. Mechanistic arguments can be synchronic or diachronic.

Metaphor: linguistic trope that shows similarities by equivalence or identity between objects or events. Metaphor reveals similarities and differences by producing analogies or similes. Metaphor underlies Formist arguments, Romantic plots and Anarchist ideology.

Metapopulation: a population divided into groups living in separate patches but connected by dispersal of individuals between these patches.

Metonymy: linguistic trope that reduces a whole into parts. The name or meaning of a part of an object represents the whole object, creating part-part relationships. Metonymy is associated with Mechanistic argumentation, Tragic emplotment and Radical ideology.

Narrative structures: the means by which material is organised into a narrative, which underlies all forms of writing, and are emplotment, formal argument, ideological implications and tropes.

Natal range: the range occupied by an individual from birth.

Niche: the habitat and resources required by a species for survival.

Niche shifts: changes in the availability of resources resulting in behavioural adaptation and dietary and/or ecological adjustments for the species affected.

Organicist argumentation: mode of argumentation that aims to be integrative and reductive by showing how elements are part of a synthetic whole, due to the underlying essences or principles that link elements into an integrated whole. Each stage of the plot prefigures the outcome of the narrative, and the argument can be synchronic or diachronic. Organicist arguments focus on human creativity and freedom.

Parent population: the source of a dispersing or colonising population.

Phenotype: the physical expression of the genetic makeup of an individual.

Phylogeny: the evolutionary ancestor-descendent relationships between species.

Physical barrier: conditions of temperature, moisture or chemistry beyond the tolerance limits of a species.

Pioneers: individuals who are filling to explore unknown territory during the earliest stages of a migration, providing information about destinations for their followers.

Plot: the sequence of events in a narrative.

Population front: the edge of the primary population undergoing expansion.

Primary population: the main population expanding during a biological invasion, which is large enough to form an independently reproducing centre of expansion.

Propagule pressure: the size of the population involved in a biological invasion.

Pull factors: causes of attraction of a migration flow towards a destination.

Push factors: causes of dissatisfaction with conditions at the origin of a migration flow.

r-selection: species that invest heavily in reproduction by producing large numbers of offspring and having short generation times.

Radical: ideology within a narrative that considers society to require major changes, which can take place rapidly but must be encouraged in order to overcome inertia and achieve a revolution, which would produce utopia in the imminent future.

Rapoport effect: the correlation between the range size of a species and its latitude.

Realised niche: the area within the fundamental niche in which the species actually occurs, limited by foraging efficiency, competition and community interactions.

Romance: plot structure of a narrative in which the hero transcends the world of experience, is victorious over the challenges encountered, and finally achieves liberation, allowing new forces in the world of experience.

Satellite populations: small local centres of population beyond the population front of the primary population of a biological invasion, which may be large enough to reproduce and become secondary centres of expansion.

Satire: plot structure of a narrative in which the hero is a captive of the world, unable to overcome its challenges or escape fate. The opposite of romance.

Sclerophyll: tough, evergreen, and small leafed trees adapted to hot and dry summer climatic regimes.

Source-sink: population in the sink cannot reproduce due to poor resources, and is sustained by flows from the source, where conditions are more favourable.

Spread: any historical biogeographical process of expansion into previously unoccupied territory.

Step migration: a series of incremental short distance moves, initially within the original social network, but eventually resulting in movement over substantial distances and entry into new social networks.

Sweepstake dispersal: see jump dispersal.

Synecdoche: linguistic trope that integrates parts into a whole. The whole becomes identical to the parts that make it, and the parts symbolise a quality present in the whole. Synecdoche underlies Organicist argumentation, Comic emplotment and Conservative ideology.

Tragedy: plot structure of a narrative in which the hero battles fate and fails, resulting in eventual acceptance of fate as the forces of the world are beyond the control of the protagonists and cannot be changed.

Trope: the narrative structure underlying the plot, formal argument and ideology, which brings together the elements of the story in a coherent conceptual mode. Tropes provide meaning by comparing the unfamiliar concepts of the narrative to known objects and events. The linkages used as tropes are Metaphor, Metonymy, Synecdoche and Irony.

Trophic level: position in the food chain of the ecological community, with producers of energy (plants) forming the first level, and herbivores the second, carnivores the third, and predators of carnivores the highest levels

Appendix Two: The Lower Palaeolithic sites.

The major divisions of the Pleistocene.

Date	Date Probability	Probability	Country	Site Name	Reference
EEP	Definite	Definite	Algeria	El Kherba	(Sahnouni *et al.* 1996)
EEP	Definite	Definite	Algeria	Ain Hanech	(Sahnouni *et al.* 2002), (Sahnouni 1995), (Jaeger 1975), (Sahnouni 1998), (Sahnouni 1998), (Sahnouni *et al.* 1996)
EEP	Definite	Definite	Egypt	Abassiyeh / Abassieh	(Bovier-Lapierre 1926), (Bovier-Lapierre 1925)
EEP	Definite	Definite	Georgia	Dmanisi layer III	(Ljubin and Bosinski 1995), (Gabunia *et al.* 2000)
EEP	Definite	Definite	Georgia	Dmanisi layer II	(Ljubin and Bosinski 1995), (Gabunia *et al.* 2000)
EEP	Definite	Definite	Georgia	Dmanisi layer V + IV	(Ljubin and Bosinski 1995), (Gabunia *et al.* 2000), (Džaparidze *et al.* 1989)
EEP	Definite	Definite	Israel	Nahal Zihor group 1	(Ginat *et al.* 2003)
EEP	Definite	Definite	Israel	'Ubeidiya Li cycle	(Bar-Yosef 1994), (Bar-Yosef 1998), (Tchernov *et al.* 1994), (Horowitz 1989), (Bar-Yosef and Goren-Inbar 1993), (Tchernov 1987)

Date	Date Probability	Probability	Country	Site Name	Reference
EEP	Definite	Definite	Israel	'Ubeidiya Fi cycle	(Bar-Yosef 1994), (Bar-Yosef 1998), (Tchernov *et al.* 1994), (Belmaker *et al.* 2002), (Horowitz 1989), (Bar-Yosef and Goren-Inbar 1993), (Tchernov 1987)
EEP	Definite	Probable	France	Nolhac	(Bonifay 1991), (Bracco 1991)
EEP	Definite	Probable	Portugal	Seixosa	(Raposo and Carreira 1986)
EEP	Definite	Unlikely	Croatia	Sandalja I	(Valoch 1995), (Malez 1976)
EEP	Definite	Unlikely	France	Ceyssaguet	(de Lumley *et al.* 1988), (Bonifay 1986), (Guérin *et al.* 2003)
EEP	Definite	Unlikely	France	Chilhac III	(Guth 1974), (Raynal *et al.* 1995a), (Beden and Guth 1970)
EEP	Definite	Unlikely	France	Durance valley, Brigadel terrace	(Dubar 1975)
EEP	Definite	Unlikely	France	Durance valley, Ruffe terrace	(Dubar 1975)
EEP	Definite	Unlikely	Portugal	Quinta do Peru	(Raposo and Carreira 1986)
EEP	Definite	Unlikely	Portugal	Basteza da Mo	(Raposo and Carreira 1986)
EEP	Definite	Unlikely	Portugal	Santa Marta	(Raposo and Carreira 1986)
EEP	Definite	Unlikely	Portugal	Quinta dos Arcos	(Raposo and Carreira 1986)
EEP	Definite	Unlikely	Romania	Tetoiu (Bugiulesti)	(Valoch 1995), (Nicolaescu-Plopsor and Nicolaescu-Plopsor 1963)
EEP	Definite	Unlikely	Spain	Tajo valley	(Raposo and Santonja 1995), (Querol 1984)
EEP	Definite	Unlikely	Spain	Venta Micena	(Gibert *et al.* 2001), (Roe 1995), (Martínez Navarro 1992), (Gibert *et al.* 1992)

Date	Date Probability	Probability	Country	Site Name	Reference
EEP	Probable	Definite	Spain	Fuentenueva 3	(Agustí *et al.* 2000), (Gibert *et al.* 2001), (Roe 1995), (Gibert *et al.* 1998), (Martinez Navarro *et al.* 1997)
EEP	Probable	Probable	Spain	Barranco Leon	(Gibert *et al.* 2001), (Roe 1995), (Gibert *et al.* 1998), (Oms *et al.* 2000)
EEP	Probable	Unlikely	Czech Republic	Beroun A III	(Valoch 1995), (Fridrich 1991a)
EEP	Probable	Unlikely	Czech Republic	Beroun A II	(Valoch 1995), (Fridrich 1991a)
EEP	Probable	Unlikely	France	Durance valley, Bois-St-Martin terrace	(Dubar 1975)
EEP	Probable	Unlikely	Spain	Cueva Victoria	(Carbonell *et al.* 1995b), (Gibert *et al.* 1995), (de Lumley *et al.* 1988), (Carbonell *et al.* 1981)
MEP	Definite	Unlikely	France	Vallonnet	(Bonifay 1996), (Bonifay 1991), (White 1995), (Renault-Miskovsky 1995), (de Lumley *et al.* 1988), (de Lumley 1975)
MEP	Definite	Unlikely	France	Saint-Prest	(Bonifay 1996), (Bourdier 1969), (Bourdier 1962), (Guérin *et al.* 2003)
MEP	Definite	Unlikely	Spain	Sima del Elefante E-11	(Falguères *et al.* 2001)
MEP	Probable	Definite	Jordan	Dauqara Formation, Upper Zarqa Valley	(Parenti *et al.* 1997)
MEP	Probable	Definite	Lebanon	Dahr el Assiye	(Sanlaville 1979)
MEP	Probable	Definite	Spain	Fuentenueva 3	(Agustí *et al.* 2000), (Gibert *et al.* 2001), (Roe 1995), (Gibert *et al.* 1998), (Martinez Navarro *et al.* 1997)

Date	Date Probability	Probability	Country	Site Name	Reference
MEP	Probable	Definite	Syria	Sitt Markho	(Copeland and Hours 1978), (Horowitz 1989), (Sanlaville 1979), (Besançon *et al.* 1977)
MEP	Probable	Definite	Syria	Mchairfet es Samouk	(Sanlaville 1979)
MEP	Probable	Probable	Lebanon	Borj Qinnaret	(Parenti *et al.* 1997), (Sanlaville 1979), (Hours and Sanlaville 1972)
MEP	Probable	Probable	Portugal	Mirouco	(Raposo and Santonja 1995), (Raposo 1985), (Raposo and Carreira 1986)
MEP	Probable	Unlikely	Czech Republic	Mladec shaft III	(Valoch 1995), (Valoch 1996b)
MEP	Probable	Unlikely	Czech Republic	Praha-Suchdol	(Fridrich 1976)
MEP	Probable	Unlikely	Spain	Cueva Victoria	(Carbonell *et al.* 1995b), (Gibert *et al.* 1995), (de Lumley *et al.* 1988), (Carbonell *et al.* 1981)
LEP	Definite		France	Saint-Thibery	(de Lumley *et al.* 1988)
LEP	Definite	Definite	Czech Republic	Stare Mesto 1, series 1	(Chlachula 1994), (Chlachula 1993)
LEP	Definite	Definite	Italy	Monte Poggiolo	(Mussi 1995), (Villa 2001), (Milliken 1997), (Falguères 2003), (Antoniazzi *et al.* 1988)
LEP	Definite	Definite	Italy	Castro dei Volsci	(Segre and Biddittu 1981), (Ascenzi and Segre 1997), (Piperno *et al.* 1984), (Biddittu 1974)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Definite	Definite	Lebanon	Joubb Jannine	(Copeland and Hours 1978), (Besançon *et al.* 1970), (Besançon *et al.* 1982), (Bar-Yosef 1998), (Sanlaville 1979)
LEP	Definite	Definite	Morocco	Thomas-1 quarry member L	(Raynal *et al.* 1995b), (Raynal *et al.* 2001), (Raynal and Texier 1989)
LEP	Definite	Definite	Syria	Maharde 1	(Copeland and Hours 1993)
LEP	Definite	Definite	Syria	Latamne	(Bar-Yosef 1994), (Bar-Yosef 1998), (Tchernov *et al.* 1994), (Horowitz 1989)
LEP	Definite	Probable	France	Roussillon Plain high terrace	(Villa 1983), (de Lumley *et al.* 1988), (de Lumley *et al.* 1976)
LEP	Definite	Probable	Germany	Koblenz	(Bosinski 1995b), (von Berg and Fiedler 1983), (Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Wegner and Ament 1986)
LEP	Definite	Probable	Turkey	Dursunlu	(Güleç *et al.* 1999)
LEP	Definite	Unlikely	Czech Republic	Brno-Cerveny Kopec	(Valoch 1995), (Valoch 1996b)
LEP	Definite	Unlikely	France	Millau	(Joyes 1996)
LEP	Definite	Unlikely	Germany	Karlich B2	(Bosinski 1995b), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
LEP	Definite	Unlikely	Germany	Karlich B1	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Würges 1986), (Kulemeyer 1988)
LEP	Definite	Unlikely	Germany	Karlich A	(Bosinski 1995b), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Probable		Spain	Atapuerca TD5	(Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002)
LEP	Probable		Syria	Sqoubine	(Sanlaville 1979)
LEP	Probable	Definite	Israel	Kefar Menahem / Halulim	(Gilead and Israel 1975), (Bar-Yosef 1998)
LEP	Probable	Definite	Israel	Bizat Ruhama	(Ronen *et al.* 1998), (Ron *et al.* 2003)
LEP	Probable	Definite	Italy	Romanina Bianca	(Fontana *et al.* 1998), (Farabagoli 1996)
LEP	Probable	Definite	Italy	Fornace	(Fontana *et al.* 1998)
LEP	Probable	Definite	Italy	Campo Grande	(Ascenzi *et al.* 1996)
LEP	Probable	Definite	Italy	Ca' Poggio	(Fontana *et al.* 1998)
LEP	Probable	Definite	Italy	Bel Poggio	(Fontana *et al.* 1998)
LEP	Probable	Definite	Italy	Podere Canestri / Forlimpopoli	(Aldini *et al.* 1998)
LEP	Probable	Definite	Italy	Ceprano	(Villa 2001), (Ascenzi *et al.* 1996), (Manzi 2001), (Manzi *et al.* 2001), (Ascenzi *et al.* 2000), (Ascenzi and Segre 1997)
LEP	Probable	Definite	Jordan	Dauqara Formation, Upper Zarqa Valley	(Parenti *et al.* 1997)
LEP	Probable	Definite	Lebanon	Ras Beyrouth / Ras Beirut 1b	(Copeland and Hours 1978), (Fleisch and Sanlaville 1974), (Bar-Yosef 1998)
LEP	Probable	Definite	Lebanon	Dahr el Assiye	(Sanlaville 1979)
LEP	Probable	Definite	Lebanon	Ouadi Aabet	(Copeland and Hours 1978), (Fleisch and Sanlaville 1974)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Probable	Definite	Portugal	Laredo das Corchas a Ponta Ruiva	(Raposo and Carreira 1986)
LEP	Probable	Definite	Spain	Almonacid de Toledo	(Raposo and Santonja 1995)
LEP	Probable	Definite	Spain	Atapuerca TD6	(Raposo and Santonja 1995), (Mosquera Martinez 1996), (Bermudez de Castro *et al.* 1999), (Falgueres *et al.* 1999), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Falguères 2003), (Garcia and Arsuaga 1999), (van der Made 1999)
LEP	Probable	Definite	Syria	Zaitiye 1	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Hama 5 (Sharia)	(Copeland and Hours 1993), (Hours 1975)
LEP	Probable	Definite	Syria	Jibtaa Khellaleh	(Copeland and Hours 1978), (Sanlaville 1979), (Besançon *et al.* 1977)
LEP	Probable	Definite	Syria	Berzine	(Copeland and Hours 1978), (Bar-Yosef 1998), (Sanlaville 1979), (Besançon *et al.* 1977)
LEP	Probable	Definite	Syria	Arze Quarry	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Jrabiyat 5	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Qadib el Ban 1	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Qadib el Ban 2	(Copeland and Hours 1993)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Probable	Definite	Syria	Jabal Idriss I.II	(Copeland and Hours 1978), (Sanlaville 1979), (Besançon *et al.* 1977)
LEP	Probable	Definite	Syria	Khattab 2	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Maharde 2	(Copeland and Hours 1993)
LEP	Probable	Definite	Syria	Sitt Markho	(Copeland and Hours 1978), (Horowitz 1989), (Sanlaville 1979), (Besançon *et al.* 1977)
LEP	Probable	Definite	Syria	Cheikh Mohammed	(Copeland and Hours 1978), (Sanlaville 1979), (Besançon *et al.* 1977)
LEP	Probable	Definite	Syria	Rastan	(Sanlaville 1979), (Copeland and Hours 1993), (Hours 1975)
LEP	Probable	Definite	Syria	Jabal Jibtaa	(Sanlaville 1979)
LEP	Probable	Definite	Syria	Mchairfet es Samouk	(Sanlaville 1979)
LEP	Probable	Definite	Syria	Gharmachi 1a	(Copeland and Hours 1993)
LEP	Probable	Probable	Czech Republic	Stasov	(Fridrich 1991b)
LEP	Probable	Probable	France	Cabestany	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
LEP	Probable	Probable	France	Pont-de-la-Hulauderie	(Monnier and Despriée 1991)
LEP	Probable	Probable	Holland	Kwintelooijen	(Peeters *et al.* 1988b)
LEP	Probable	Probable	Holland	Rooth-Nekami	(Peeters *et al.* 1988b)
LEP	Probable	Probable	Italy	Arce	(Mussi 1995), (Villa 2001), (Biddittu 1972)
LEP	Probable	Probable	Italy	Fontana Liri	(Mussi 1995), (Villa 2001), (Biddittu 1972)
LEP	Probable	Probable	Italy	Nocicchio	(Mussi 1995)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Probable	Probable	Lebanon	Borj Qinnaret	(Parenti *et al.* 1997), (Sanlaville 1979), (Hours and Sanlaville 1972)
LEP	Probable	Probable	Portugal	Acafora	(Raposo and Santonja 1995), (Raposo 1985), (Raposo and Carreira 1986)
LEP	Probable	Probable	Portugal	Mirouco	(Raposo and Santonja 1995), (Raposo 1985), (Raposo and Carreira 1986)
LEP	Probable	Probable	Portugal	Ericeira	(Raposo and Santonja 1995)
LEP	Probable	Probable	Portugal	Areias	(Raposo and Santonja 1995)
LEP	Probable	Probable	Portugal	Praia da Aguda	(Raposo and Santonja 1995), (Raposo 1985), (Raposo and Carreira 1986)
LEP	Probable	Probable	Portugal	Magoito	(Raposo and Santonja 1995), (Raposo 1985), (Raposo and Carreira 1986)
LEP	Probable	Probable	Roumania	Dirjov	(Nicolaescu-Plopsor and Morosan 1959)
LEP	Probable	Probable	Russia	Gerasimovka	(Praslov 1995)
LEP	Probable	Probable	Spain	Barranco Leon	(Gibert *et al.* 2001), (Roe 1995), (Gibert *et al.* 1998), (Oms *et al.* 2000)
LEP	Probable	Probable	Syria	Abu Obeida	(Copeland and Hours 1993)
LEP	Probable	Probable	Syria	Hama 2 (Sharia)	(Copeland and Hours 1993), (Hours 1975)
LEP	Probable	Probable	Syria	Fidio	(Sanlaville 1979)
LEP	Probable	Probable	Syria	El-Farche 1	(Copeland and Hours 1993)
LEP	Probable	Probable	Syria	Khor-el Aassi	(Copeland and Hours 1993)
LEP	Probable	Probable	Syria	Ain el Labane	(Sanlaville 1979)

Date	Date Probability	Probability	Country	Site Name	Reference
LEP	Probable	Probable	Syria	Ard Habibe	(Copeland and Hours 1993)
LEP	Probable	Unlikely	Azerbaijan	Azych layers X-VII	(Ljubin and Bosinski 1995), (Lioubine 2002)
LEP	Probable	Unlikely	Czech Republic	Beroun A II	(Valoch 1995), (Fridrich 1991a)
LEP	Probable	Unlikely	Czech Republic	Ivan I	(Valoch 1995), (Valoch 1996b)
LEP	Probable	Unlikely	Czech Republic	Musov I	(Valoch 1995)
LEP	Probable	Unlikely	Georgia	Achalkalaki	(Ljubin and Bosinski 1995), (Gabunia 2000), (Tappen *et al.* 2002)
LEP	Probable	Unlikely	Italy	Monte Peglia	(Mussi 1995), (Peretto 1995), (Radmilli 1976), (van der Meulen 1973), (Piperno *et al.* 1984)
LEP	Probable	Unlikely	Spain	Toro / Pinar del Canto	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996)
LEP	Probable	Unlikely	Spain	Atapuerca TD4	(Raposo and Santonja 1995), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Turner 1995)
LEP	Probable	Unlikely	Spain	Monfarracinos	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996), (Vallespí Pérez 1987)
EMP	Definite	Definite	Morocco	Gandhour Ben Habib	(Raynal *et al.* 1995b)
EMP	Definite	Definite	Portugal	Lis valley Q2a	(Raposo and Santonja 1995), (Cunha-Ribeiro 1992)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Definite	Definite	Portugal	Quinta do Conego / Pousias	(Raposo and Santonja 1995), (Moloney 1996), (Cunha-Ribeiro 1996), (Cunha-Ribeiro 1990), (Cunha-Ribeiro 1992)
EMP	Definite	Definite	Spain	San Quirce	(Raposo and Santonja 1995), (Arnaiz Alonso 1990), (Santonja 1996)
EMP	Definite	Probable	Czech Republic	Mladec	(Valoch 1995), (Bucha *et al.* 1975), (Valoch 1996b)
EMP	Definite	Probable	France	Vidauban	(Defleur *et al.* 1991)
EMP	Definite	Probable	France	Barbas couche 7	(Geneste *et al.* 1991), (Boeda and Kervazo 1991)
EMP	Definite	Probable	Portugal	Ribamar	(Raposo and Santonja 1995)
EMP	Definite	Probable	Spain	Loma de las Monjas	(Giles Pacheco *et al.* 1996)
EMP	Definite	Unlikely	France	Montieres, Ferme de Grace	(Bourdier 1976b), (Munaut 1988), (Bourdier *et al.* 1974b), (Agache 1963)
EMP	Definite	Unlikely	Greece/ Corfu	Korrissia	(Darlas 1995), (Kourtessi-Philippakis 1993)
EMP	Definite	Unlikely	Russian Federation	Cimbal (Taman peninsula)	(Ljubin and Bosinski 1995), (Bonifay 1980)
EMP	Definite	Unlikely	Spain	Molino del Emperador	(Giles Pacheco *et al.* 1996)
EMP	Probable	Definite	Czech Republic	Pribice I	(Valoch 1977)
EMP	Probable	Definite	France	Saint-Loubes	(Geneste *et al.* 1991), (Moisan 1987)
EMP	Probable	Definite	France	Wimereux, La Pointe-aux-Oies	(Tuffreau and Antoine 1995), (de Lumley *et al.* 1988), (Tuffreau 1971)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Probable	Definite	France	Le Rivalou	(Tavoso 1976a), (Tavoso 1976b)
EMP	Probable	Definite	France	Saint-Selve	(Geneste *et al.* 1991)
EMP	Probable	Definite	France	Caillevat-Beurret	(Geneste *et al.* 1991)
EMP	Probable	Definite	France	Wissant	(Agache 1971)
EMP	Probable	Definite	France	Labastide d'Anjou	(de Lumley 1975)
EMP	Probable	Definite	Greece	Petralona	(Darlas 1995), (Grün 1996), (Poulianos 1989)
EMP	Probable	Definite	Israel	Bizat Ruhama	(Ronen *et al.* 1998), (Ron *et al.* 2003)
EMP	Probable	Definite	Italy	Campo Grande	(Ascenzi *et al.* 1996)
EMP	Probable	Definite	Italy	Ca' Poggio	(Fontana *et al.* 1998)
EMP	Probable	Definite	Italy	Ceprano	(Villa 2001), (Ascenzi *et al.* 1996), (Manzi *et al.* 2001), (Manzi 2001), (Ascenzi *et al.* 2000), (Ascenzi and Segre 1997)
EMP	Probable	Definite	Italy	Bel Poggio	(Fontana *et al.* 1998)
EMP	Probable	Definite	Italy	Isernia La Pineta II t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
EMP	Probable	Definite	Italy	Podere Canestri / Forlimpopoli	(Aldini *et al.* 1998)
EMP	Probable	Definite	Italy	Isernia La Pineta 3S10	(Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995b)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Probable	Definite	Italy	Isernia La Pineta I t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995a), (Sevink *et al.* 1981), (Giusberti and Peretto 1991)
EMP	Probable	Definite	Italy	Romanina Bianca	(Fontana *et al.* 1998), (Farabagoli 1996)
EMP	Probable	Definite	Italy	Casella di Maida	(Villa 2001), (Gambassini and Ronchitelli 1982)
EMP	Probable	Definite	Italy	Isernia La Pineta I t.3c	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
EMP	Probable	Definite	Jordan	Abu Habil	(Muheisen 1988)
EMP	Probable	Definite	Lebanon	Ouadi Aabet	(Copeland and Hours 1978), (Fleisch and Sanlaville 1974)
EMP	Probable	Definite	Lebanon	Ras Beyrouth / Ras Beirut 1b	(Copeland and Hours 1978), (Fleisch and Sanlaville 1974), (Bar-Yosef 1998)
EMP	Probable	Definite	Lebanon	Ras Beirut Ia	(Hours 1975)
EMP	Probable	Definite	Morocco	Thomas Quarry 1 hominid level	(Raynal *et al.* 2001)
EMP	Probable	Definite	Morocco	Oulad Hamida 1 Grotte des Rhinoceros	(Raynal *et al.* 1995b), (Raynal *et al.* 2001), (Raynal *et al.* 1993), (Rhodes *et al.* 1994), (Geraads 1994)
EMP	Probable	Definite	Portugal	Vale do Forno	(Raposo and Santonja 1995), (Meireles and Cunha-Ribeiro 1996)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Probable	Definite	Portugal	Lis valley Q3	(Raposo and Santonja 1995), (Cunha-Ribeiro 1996), (Cunha-Ribeiro 1992)
EMP	Probable	Definite	Portugal	Lis valley Q3	(Raposo and Santonja 1995), (Cunha-Ribeiro 1996), (Cunha-Ribeiro 1992)
EMP	Probable	Definite	Spain	Guadalquivir valley T8	(Raposo and Santonja 1995), (Vallespí *et al.* 1988)
EMP	Probable	Definite	Spain	Atapuerca TD6	(Raposo and Santonja 1995), (Mosquera Martinez 1996), (Bermudez de Castro *et al.* 1999), (Falgueres *et al.* 1999), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Falguères 2003), (Garcia and Arsuaga 1999), (van der Made 1999)
EMP	Probable	Definite	Spain	Guadalquivir valley T6	(Raposo and Santonja 1995)
EMP	Probable	Definite	Spain	Almonacid de Toledo	(Raposo and Santonja 1995)
EMP	Probable	Definite	Spain	Puig d'en Roca	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Carbonell *et al.* 1988)
EMP	Probable	Definite	Spain	Costa Roja	
EMP	Probable	Definite	Spain	Perilla del Castro	(Santonja and Villa 1990), (Giles Pacheco *et al.* 1996)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Probable	Definite	Syria	Jibtaa Khellaleh	(Copeland and Hours 1978), (Sanlaville 1979), (Besançon *et al.* 1977)
EMP	Probable	Definite	Syria	Jabal Jibtaa	(Sanlaville 1979)
EMP	Probable	Definite	Syria	Maharde 2	(Copeland and Hours 1993)
EMP	Probable	Probable	Czech Republic	Svedske sance	(Valoch 1995), (Valoch 1996b)
EMP	Probable	Probable	France	Pont-de-la-Hulauderie	(Monnier and Despriée 1991)
EMP	Probable	Probable	France	Belle-Assise de Lisle	(Despriée and Lorain 1982)
EMP	Probable	Probable	France	Chene-Carre de Pezou	(Despriée and Lorain 1982)
EMP	Probable	Probable	France	La Rafette	(Geneste *et al.* 1991), (Moisan 1987), (Bouvier and Rousseau 1972)
EMP	Probable	Probable	France	Verdier	(Geneste *et al.* 1991)
EMP	Probable	Probable	Italy	Nocicchio	(Mussi 1995)
EMP	Probable	Probable	Italy	Colle Marino	(Mussi 1995), (Peretto 1995), (Villa 2001), (Piperno *et al.* 1984)
EMP	Probable	Probable	Italy	Fontana Liri	(Mussi 1995), (Villa 2001), (Bidditu 1972)
EMP	Probable	Probable	Italy	Arce	(Mussi 1995), (Villa 2001), (Bidditu 1972)
EMP	Probable	Probable	Italy	Pagliare di Sassa	(Palombo *et al.* 2001)
EMP	Probable	Probable	Jordan	Upper Zarqa Dauqara formation	(Copeland and Hours 1988)
EMP	Probable	Probable	Russia	Gerasimovka	(Praslov 1995)
EMP	Probable	Probable	Spain	El Espinar	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996)
EMP	Probable	Probable	Syria	Ard Habibe	(Copeland and Hours 1993)

Date	Date Probability	Probability	Country	Site Name	Reference
EMP	Probable	Probable	Syria	Abu Obeida	(Copeland and Hours 1993)
EMP	Probable	Probable	Syria	El-Farche 1	(Copeland and Hours 1993)
EMP	Probable	Probable	Syria	Khor-el Aassi	(Copeland and Hours 1993)
EMP	Probable	Unlikely	Azerbaijan	Azych layers X-VII	(Ljubin and Bosinski 1995), (Lioubine 2002)
EMP	Probable	Unlikely	Czech Republic	Cernovice	(Valoch 1995)
EMP	Probable	Unlikely	Czech Republic	Ivan I	(Valoch 1995), (Valoch 1996b)
EMP	Probable	Unlikely	Czech Republic	Musov I	(Valoch 1995)
EMP	Probable	Unlikely	Georgia	Achalkalaki	(Ljubin and Bosinski 1995), (Gabunia 2000), (Tappen *et al.* 2002)
EMP	Probable	Unlikely	Spain	Toro / Pinar del Canto	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996)
EMP	Probable	Unlikely	Spain	Puente Morena	(Giles Pacheco *et al.* 1996)
EMP	Probable	Unlikely	Spain	Monfarracinos	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996), (Vallespí Pérez 1987)
MMP	Definite	Definite	Czech Republic	Stare Mesto I, series 2	(Chlachula 1994), (Chlachula 1993)
MMP	Definite	Definite	England	Farthingworth Green	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Hillingdon	(Gibbard and Wymer 1983), (Roe 1968)
MMP	Definite	Definite	England	Highlands Farm	(Gibbard and Wymer 1983), (Bridgland 1994), (Roe 1968)
MMP	Definite	Definite	England	High Lodge bed E	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	England	High Lodge bed D	(Roberts *et al.* 1995), (Ashton *et al.* 1992), (Cook *et al.* 1991)
MMP	Definite	Definite	England	High Lodge bed C2	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)
MMP	Definite	Definite	England	High Lodge bed B	(Roberts *et al.* 1995), (Cook *et al.* 1991), (Ashton *et al.* 1992)
MMP	Definite	Definite	England	Notley Road Pit	(Wymer 1999), (Roe 1968), (Wymer 1985)
MMP	Definite	Definite	England	Hampstead Marshall	(Gibbard and Wymer 1983), (Wymer 1999), (Bridgland 1994)
MMP	Definite	Definite	England	Greenham	(Wymer 1999), (Bridgland 1994)
MMP	Definite	Definite	England	Hockwold	(Wymer 1999), (Wymer 1985), (Roe 1968)
MMP	Definite	Definite	England	Feltwell, Shrub Hill	(Wymer 2001), (Wymer 1999), (Roe 1968), (Wymer 1985)
MMP	Definite	Definite	England	High Lodge bed C1	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)
MMP	Definite	Definite	England	Farnham terrace A	(Wymer 1999), (Roe 1981)
MMP	Definite	Definite	England	Englefield	(Gibbard and Wymer 1983), (Roe 1968)
MMP	Definite	Definite	England	Brimpton	(Wymer 1999)
MMP	Definite	Definite	England	Brandon	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Boxgrove units 6-8	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	England	Boxgrove unit 5a	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
MMP	Definite	Definite	England	Boxgrove unit 4c&d	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
MMP	Definite	Definite	England	Boxgrove unit 4b	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
MMP	Definite	Definite	England	Boxgrove unit 3	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
MMP	Definite	Definite	England	Boxgrove unit 11	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
MMP	Definite	Definite	England	Fordwich	(Bridgland *et al.* 1998a), (White 1998), (Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Tilehurst	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Wolvey	(Wymer 1999)
MMP	Definite	Definite	England	Waverley Wood	(Roberts *et al.* 1995), (Shotten *et al.* 1993)
MMP	Definite	Definite	England	Hangar Lane	(Wymer 1999)
MMP	Definite	Definite	England	Kennylands	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Wasing	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Wash Common, Newbury	(Wymer 1999), (Bridgland 1994), (Roe 1968)
MMP	Definite	Definite	England	Wallingford	(Gibbard and Wymer 1983), (Wymer 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	England	Tidmarsh	(Gibbard and Wymer 1983), (Roe 1968)
MMP	Definite	Definite	England	Sweetings Farm	(Wymer 1999), (Roe 1968), (Wymer 1985)
MMP	Definite	Definite	England	Sulhampstead	(Wymer 1999), (Bridgland 1994), (Roe 1968)
MMP	Definite	Definite	England	Sulham	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	St. George's Hill, Weybridge	(Wymer 1999)
MMP	Definite	Definite	England	Kent's Cavern	(Roberts *et al.* 1995), (Cook and Jacobi 1998), (Roe 1968), (Roe 1981), (Campbell and Sampson 1971)
MMP	Definite	Definite	England	Slindon	(Woodcock 1986), (Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Maldon	(Bridgland 1994), (Roe 1968), (Wymer 1985)
MMP	Definite	Definite	England	Warren Hill	(Roberts *et al.* 1995), (Wymer *et al.* 1991), (Wymer 1999), (Roe 1968)
MMP	Definite	Definite	England	Lakenheath	(Wymer 1999), (Roe 1968)
MMP	Definite	Definite	France	Saint-Acheul, rue Marcelin Berthelot	
MMP	Definite	Definite	France	Soleilhac	(Raynal *et al.* 1995a), (Bonifay 1996), (Bonifay 1991), (Bracco 1991), (Fosse and Bonifay 1991), (Thouveny and Bonifay 1984)
MMP	Definite	Definite	France	Roussillon plain middle terrace	(Villa 1983), (de Lumley *et al.* 1976)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	France	La Nauterie layers 13/14	(Bonifay 1996), (Geneste *et al.* 1991), (Prat and Thibault 1976), (Paquereau 1976)
MMP	Definite	Definite	France	Mas Romeu	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
MMP	Definite	Definite	France	Cagny-la Garenne unit 2	(Bourdier *et al.* 1974a)
MMP	Definite	Definite	France	Ternere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
MMP	Definite	Definite	France	Cagny-la Garenne unit 1	(Agache 1971), (Lamotte 2001)
MMP	Definite	Definite	France	Coll de la Guille	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
MMP	Definite	Definite	France	Carriere Carpentier	
MMP	Definite	Definite	France	Butte Four	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
MMP	Definite	Definite	France	Caune de l'Arago unit II	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley *et al.* 1988), (de Lumley *et al.* 1979)
MMP	Definite	Definite	France	Caune de l'Arago unit III	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley *et al.* 1988), (de Lumley *et al.* 1979)
MMP	Definite	Definite	France	Champ de Mars	(Bourdier 1976a)
MMP	Definite	Definite	France	Rodes	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	Georgia	Kudaro III level 8a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Definite	Definite	Georgia	Kudaro III level 8	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Definite	Definite	Germany	Karlich H	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
MMP	Definite	Definite	Germany	Mauer	(Vollbrecht 1995b)
MMP	Definite	Definite	Germany	Miesenheim 1	(Turner 2000b), (Vollbrecht 1997)
MMP	Definite	Definite	Germany	Karlich G	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
MMP	Definite	Definite	Italy	Venosa-Notarchirico A	(Mussi 1995), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Venosa-Notarchirico B	(Mussi 1995), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Venosa-Notarchirico C	(Mussi 1995), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Venosa-Notarchirico E1	(Mussi 1995), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Venosa-Notarchirico alpha	(Mussi 1995), (Villa 2001), (Milliken 1997), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Venosa-Notarchirico A1	(Villa 2001)
MMP	Definite	Definite	Italy	Venosa-Loreto level A	(Mussi 1995), (Milliken 1997), (Caloi and Palombo 1979), (Barral and Simone 1983)
MMP	Definite	Definite	Italy	Venosa-Notarchirico D	(Mussi 1995), (Belli *et al.* 1991)
MMP	Definite	Definite	Italy	Quarto delle Cinfonare	(Milliken *et al.* 1998), (Peretto *et al.* 1997)
MMP	Definite	Definite	Italy	Venosa-Notarchirico E	(Mussi 1995), (Belli *et al.* 1991)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Definite	Definite	Russian Federation	Treugol'naja Cave 7b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
MMP	Definite	Definite	Russian Federation	Treugol'naja Cave 7a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
MMP	Definite	Definite	Spain	Cullar de Baza I	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Ruiz Bustos *et al.* 1982), (Ruis Bustos and Michaux 1976), (Giles Pacheco *et al.* 1996), (Alberdi *et al.* 2001)
MMP	Definite	Probable	Czech Republic	Becov 2	(Fridrich 1976)
MMP	Definite	Probable	Czech Republic	Stranska Skala I	(Valoch 1995) (Musil 1968)
MMP	Definite	Probable	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1989), (Valoch 1996b)
MMP	Definite	Probable	England	Freeland	(Hardaker 2001)
MMP	Definite	Probable	England	Wivenhoe	(Roberts *et al.* 1995), (Bridgland 1994)
MMP	Definite	Probable	England	Westbury-sub-Mendip	(Roberts *et al.* 1995), (Roe 1981), (Bishop 1975), (Andrews *et al.* 1999)
MMP	Definite	Probable	France	Hangenbieten	(Thévenin 1991), (de Lumley *et al.* 1988), (Wernert 1957)
MMP	Definite	Probable	Germany	Achenheim layer 30	(Vollbrecht 1995a), (Junkmanns 1995), (Thévenin 1991)
MMP	Definite	Unlikely	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1991b), (Valoch 1996b)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	Azerbaijan	Azych layer VI	(Ljubin and Bosinski 1995), (Lioubine 2002)
MMP	Probable	Definite	Belgium	Pa d'la l'iau	(Lamotte 2001), (Cahen 1984)
MMP	Probable	Definite	Czech Republic	Pribice I	(Valoch 1977)
MMP	Probable	Definite	England	Bembridge raised beach	(Preece and Scource 1987)
MMP	Probable	Definite	England	Straits Mill	(Wymer 1999)
MMP	Probable	Definite	England	Ridlands Farm	(Wymer 1999), (Roe 1968)
MMP	Probable	Definite	France	La Nauterie layer 11	(Bonifay 1996), (Prat and Thibault 1976)
MMP	Probable	Definite	France	Menez-Dregan 1	
MMP	Probable	Definite	France	Grotte Vaufrey c.11-13	(Geneste *et al.* 1991)
MMP	Probable	Definite	France	Saint-Selve	(Geneste *et al.* 1991)
MMP	Probable	Definite	France	Aldene J/K	(Bonifay 1996), (Bonifay 1991), (Renault-Miskovsky 1995), (Villa 1983), (Lécolle 1982), (Baïssas 1972), (Barral and Simone 1972)
MMP	Probable	Definite	France	Artenac	(Tournepiche 1984)
MMP	Probable	Definite	France	Caillevat-Beurret	(Geneste *et al.* 1991)
MMP	Probable	Definite	France	Les Courbillous	(Tavoso 1976b)
MMP	Probable	Definite	France	Cap Sizun (Plouhinec)	(Monnier and Molines 1993)
MMP	Probable	Definite	France	Saint-Loubes	(Geneste *et al.* 1991), (Moisan 1987)
MMP	Probable	Definite	France	La Llabanere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
MMP	Probable	Definite	France	Wissant	(Agache 1971)
MMP	Probable	Definite	France	Montauban	(Tavoso 1976b)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	France	Lunel-Viel / Mas des Caves	(Bonifay 1996), (Bonifay 1991), (Villa 1983), (de Lumley 1975), (Bonifay 1976), (Bonifay 1968)
MMP	Probable	Definite	France	l'Escale G	(Bonifay 1996), (Bonifay 1991), (de Lumley 1975), (Bonifay and Bonifay 1963)
MMP	Probable	Definite	France	Montmaurin, La Terrasse 2	(Villa 1983), (Girard 1976)
MMP	Probable	Definite	France	Saint-Colomban	(Monnier 1988), (Monnier and Le Cloirec 1985)
MMP	Probable	Definite	France	Stade	(Bourdier 1974)
MMP	Probable	Definite	France	Vergranne	(Bonifay 1996), (Thévenin 1991), (Vandermeersch and Tillier 1983), (Chaline 1983)
MMP	Probable	Definite	France	Wimereux, La Pointe-aux-Oies	(Tuffreau and Antoine 1995), (de Lumley *et al.* 1988), (Tuffreau 1971)
MMP	Probable	Definite	France	Labastide d'Anjou	(de Lumley 1975)
MMP	Probable	Definite	Georgia	Tsona level 7	(Ljubin and Bosinski 1995), (Lioubine 2002)
MMP	Probable	Definite	Georgia	Kudaro III level 7	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Probable	Definite	Georgia	Kudaro III level 6	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Probable	Definite	Georgia	Kudaro III level 5	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	Georgia	Kudaro I level 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Probable	Definite	Georgia	Kudaro I level 5 a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Probable	Definite	Georgia	Kudaro I level 5 v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
MMP	Probable	Definite	Greece	Petralona	(Darlas 1995), (Grün 1996), (Poulianos 1989)
MMP	Probable	Definite	Hungary	Vertesszollos	(Valoch 1995), (Kretzoi and Vertes 1965), (Kretzoi and Dobosi 1990)
MMP	Probable	Definite	Israel	Ma'ayan Baruch	(Bar-Yosef 1998), (Sanlaville 1979), (Ronen and Ohel 1980), (Stekelis and Gilead 1966)
MMP	Probable	Definite	Italy	Isernia La Pineta 3S10	(Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995b)
MMP	Probable	Definite	Italy	Venosa-Loreto level B	(Mussi 1995), (Milliken 1997)
MMP	Probable	Definite	Italy	Isernia La Pineta II t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
MMP	Probable	Definite	Italy	Visogliano A	(Mussi 1995), (Villa 2001), (Abbazzi *et al.* 2000), (Milliken 1997), (Falguères 2003), (Cattani *et al.* 1991), (Mallegni *et al.* 2002)
MMP	Probable	Definite	Italy	Le Svolte	(Radmilli 1964), (Piperno *et al.* 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	Italy	Isernia La Pineta I t.3c	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
MMP	Probable	Definite	Italy	Isernia La Pineta I t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995a), (Sevink *et al.* 1981), (Giusberti and Peretto 1991)
MMP	Probable	Definite	Italy	Fontana Ranuccio	(Mussi 1995), (Milliken 1997), (Biddittu *et al.* 1979), (Segre and Ascenzi 1984)
MMP	Probable	Definite	Italy	Cava Pompi	(Mussi 1995), (Piperno *et al.* 1984)
MMP	Probable	Definite	Italy	Ceprano	(Ascenzi *et al.* 1996), (Ascenzi and Segre 1997), (Piperno *et al.* 1984)
MMP	Probable	Definite	Italy	Marina di Camerota	(Piperno *et al.* 1984)
MMP	Probable	Definite	Morocco	Thomas Quarry 1 hominid level	(Raynal *et al.* 2001)
MMP	Probable	Definite	Morocco	Oulad Hamida 1 Grotte des Rhinoceros	(Raynal *et al.* 1995b), (Raynal *et al.* 2001), (Raynal *et al.* 1993), (Rhodes *et al.* 1994), (Geraads 1994)
MMP	Probable	Definite	Portugal	Vale do Forno	(Raposo and Santonja 1995), (Meireles and Cunha-Ribeiro 1996)
MMP	Probable	Definite	Portugal	Monte Famaco	(Santonja and Villa 1990), (Penalva 1987)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	Spain	Carmona	(Santonja and Villa 1990), (Bordes and Viguier 1969), (Giles Pacheco *et al.* 1996)
MMP	Probable	Definite	Spain	Ambrona lower occupation	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Santonja 1996), (Shipman and Rose 1983), (Perez-Gonzalez *et al.* 1999), (Villa 1983)
MMP	Probable	Definite	Spain	Guadalquivir valley T8	(Raposo and Santonja 1995), (Vallespí *et al.* 1988)
MMP	Probable	Definite	Spain	Cau d'en Borras	(Raposo and Santonja 1995), (Fernandez-Peris and Villaverde 1996), (Carbonell Roura 1992), (Gusi *et al.* 1982), (Carbonell *et al.* 1979)
MMP	Probable	Definite	Spain	La Maya III	(Raposo and Santonja 1995), (Santonja and Villa 1990)
MMP	Probable	Definite	Spain	Laguna Medina	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996)
MMP	Probable	Definite	Spain	Pinedo	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Giles Pacheco and Pérez 1987), (Santonja 1996), (Moloney 1996), (Querol and Santonja 1979), (Querol 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Definite	Spain	Torralba	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Ortega Martinez 1992), (Carbonell *et al.* 1987), (Freeman and Butzer 1966), (Santonja 1996), (Shipman and Rose 1983), (Perez-Gonzalez *et al.* 1999)
MMP	Probable	Definite	Turkey	Karain	(Otte *et al.* 1998b), (Yalçinkaya *et al.* 1992)
MMP	Probable	Definite	Turkey	Yarimburgaz	(Darlas 1995), (Farrand 1995), (Kuhn *et al.* 1998), (Kuhn *et al.* 1996)
MMP	Probable	Probable	Belgium	La Belle-Roche	(Roebroeks 1986), (Cordy 1980), (Cahen 1984)
MMP	Probable	Probable	Czech Republic	Svedske sance	(Valoch 1995), (Valoch 1996b)
MMP	Probable	Probable	Czech Republic	Becov site I-B layer II	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
MMP	Probable	Probable	Czech Republic	Becov site I-B Layer 1	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
MMP	Probable	Probable	Czech Republic	Becov site I-B layer III	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
MMP	Probable	Probable	England	Pakefield	(Stuart 1996), (Stuart and Lister 2000)
MMP	Probable	Probable	France	La Rafette	(Geneste *et al.* 1991), (Moisan 1987), (Bouvier and Rousseau 1972)
MMP	Probable	Probable	France	Verdier	(Geneste *et al.* 1991)
MMP	Probable	Probable	France	Poirier d'Armenstein	(Morin and Jacquemot 1976)
MMP	Probable	Probable	France	Chene-Carre de Pezou	(Despriée and Lorain 1982)

Date	Date Probability	Probability	Country	Site Name	Reference
MMP	Probable	Probable	Italy	Valchetta Cartoni	(Mussi 1995), (Blanc 1935)
MMP	Probable	Probable	Italy	Quinzano	(Radmilli 1976), (Cremaschi and Peretto 1988a)
MMP	Probable	Probable	Poland	Trzebnica	(Valoch 1995)
MMP	Probable	Probable	Ukraine	Korolevo VIII	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
MMP	Probable	Unlikely	Czech Republic	Cernovice	(Valoch 1995)
LMP	Definite		France	l'Igue des Rameaux	(Bonifay 1996)
LMP	Definite	Definite	Albania	Gajtan	(Darlas 1995)
LMP	Definite	Definite	Azerbaijan	Azych layer V	(Ljubin and Bosinski 1995), (Lioubine 2002)
LMP	Definite	Definite	Belgium	Petit-Spiennes	(Lamotte 2001), (Cahen 1984)
LMP	Definite	Definite	England	Barnham unit 4	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Barnham unit 7	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Wood Green	(Bridgland and Harding 1987), (Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Winch's Pit, near Maidenhead	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Wilmington	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Aldingbourne	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Barnham unit 3	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Shakespeare Farm Pit, St. Mary's Hoo	(Wymer 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	England	Barnham unit 5c	(Roberts *et al.* 1995), (Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Elveden brickearth	(Ashton *et al.* 2000a), (Paterson and Fagg 1940)
LMP	Definite	Definite	England	Barnham unit 5e	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Elveden lag gravel	(Ashton *et al.* 2000a), (Wymer 1985), (Paterson and Fagg 1940)
LMP	Definite	Definite	England	Elveden palaeosol area III	(Ashton *et al.* 2000a), (Wymer 1985), (Paterson and Fagg 1940)
LMP	Definite	Definite	England	Swanscombe Lower Loam	(Roberts *et al.* 1995), (Roe 1968), (Conway *et al.* 1996)
LMP	Definite	Definite	England	Farnham terrace A	(Wymer 1999), (Roe 1981)
LMP	Definite	Definite	England	Swanscombe Lower Gravel	(Roberts *et al.* 1995), (Roe 1968)
LMP	Definite	Definite	England	Foxhall Road, Ipswich	(Wymer 1999), (Roe 1968), (Wymer 1985)
LMP	Definite	Definite	England	Devereux's Pit, Icklingham	(Lewis 1998)
LMP	Definite	Definite	England	Stonehall Farm Pits, Redbridge	(Wymer 1999)
LMP	Definite	Definite	England	Deverill's Pit	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Hanborough	(Bridgland 1994), (Roe 1968)
LMP	Definite	Definite	England	Red Barns, Portchester	(Gamble and ApSimon 1986)
LMP	Definite	Definite	England	Orton Longueville / Hicks Brickyard	(Davey 1991), (Wymer 1999)
LMP	Definite	Definite	England	Mark's Tey	(Wymer 1999), (Wymer 1985)
LMP	Definite	Definite	England	Ingress Vale	(Wymer 1999), (Bridgland 1994), (Roe 1968)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	England	Hoxne stratum E	(Roberts *et al.* 1995), (Lewis *et al.* 2000), (Singer *et al.* 1993), (Schreve 2000), (Wymer 1985)
LMP	Definite	Definite	England	Hoxne stratum C	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
LMP	Definite	Definite	England	Hoxne bed 5	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
LMP	Definite	Definite	England	Hitchin	(Ashton *et al.* 2000b), (Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Sturry	(Bridgland *et al.* 1998b), (Bridgland *et al.* 1998b), (Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Swanscombe Upper Gravel	(Roberts *et al.* 1995), (Roe 1968)
LMP	Definite	Definite	England	Beeches Pit bed 3	(Roberts *et al.* 1995), (Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991)
LMP	Definite	Definite	England	Hoxne bed 4	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
LMP	Definite	Definite	England	Beeches Pit bed 4	(Roberts *et al.* 1995), (Preece *et al.* 1991), (Gowlett and Hallos 2000), (Preece *et al.* 2000)
LMP	Definite	Definite	England	Beeches Pit bed 5-6	(Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991), (Roberts *et al.* 1995)
LMP	Definite	Definite	England	Beeches Pit bed 7	(Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991), (Roberts *et al.* 1995)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	England	Barnham unit 6	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Barnham unit 5d	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
LMP	Definite	Definite	England	Barton Cliffs	(Bridgland 2001), (Roe 1968)
LMP	Definite	Definite	England	Swanscombe Upper Loam	(Roberts *et al.* 1995), (Roe 1968)
LMP	Definite	Definite	England	Swanscombe Upper Middle Gravel	(Roberts *et al.* 1995), (Roe 1968)
LMP	Definite	Definite	England	Swanscombe Lower Middle Gravel	(Roberts *et al.* 1995), (Roe 1968)
LMP	Definite	Definite	England	Burnham	(Wymer 1999), (Roe 1981)
LMP	Definite	Definite	England	Burnham-on-Crouch	(Bridgland 1994), (Roe 1968)
LMP	Definite	Definite	England	Chadwell St. Mary	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Clacton Lower Freshwater Bed	(Roberts *et al.* 1995), (Wymer 1985), (Roe 1968)
LMP	Definite	Definite	England	Clacton Upper Freshwater Bed	(Roberts *et al.* 1995), (Wymer 1985), (Roe 1968)
LMP	Definite	Definite	England	Cooper's Pit	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Cuxton	(Wymer 1999), (Roe 1981)
LMP	Definite	Definite	England	Dartford	(Wymer 1999), (Roe 1968)
LMP	Definite	Definite	England	Dartford Heath	(Gibbard and Wymer 1983), (Bridgland 1994), (Roe 1968)
LMP	Definite	Definite	France	La Micoque unit A/layer 1	(Falgueres *et al.* 1997), (Laville 1975), (Guichard 1976)
LMP	Definite	Definite	France	Grotte Vaufrey couche XII	(Rigaud 1989)
LMP	Definite	Definite	France	Cagny-la Garenne unit 3/4	(Bourdier *et al.* 1974a), (Lamotte 2001)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	France	Chasse Mitais a Equeurdreville	(Michel 1982)
LMP	Definite	Definite	France	La Micoque unit C/layer 2	(Falgueres *et al.* 1997), (Guichard 1976)
LMP	Definite	Definite	France	Cagny-Cimetiere	(Moigne 1988), (Bourdier *et al.* 1974a), (Tuffreau *et al.* 1982)
LMP	Definite	Definite	France	Saint-Acheul, rue de Cagny white sands	
LMP	Definite	Definite	France	Port-Pignot	(Michel 1982)
LMP	Definite	Definite	France	Toulinet	(Monnier 1982)
LMP	Definite	Definite	France	Saint-Pierre-les-Elbeuf	(Fosse 1982)
LMP	Definite	Definite	France	Teviec	(Monnier 1982)
LMP	Definite	Definite	France	Saint-Acheul, rue de Cagny gravels	(Tuffreau *et al.* 1982), (Commont 1908)
LMP	Definite	Definite	France	Terra Amata	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley 1975), (de Lumley 1966)
LMP	Definite	Definite	France	Montmaurin, La Terrasse 1	(Villa 1983)
LMP	Definite	Definite	France	Montfarville	(Michel 1982)
LMP	Definite	Definite	France	Mautort	(Tuffreau 1976)
LMP	Definite	Definite	France	Salouel	(Tuffreau 1976)
LMP	Definite	Definite	France	Saline	(Michel 1982), (Verron 1977)
LMP	Definite	Definite	Germany	Reilingen	(Czarnetzki 1991)
LMP	Definite	Definite	Germany	Neumark sud	(Mania 1995), (Mania 1984)
LMP	Definite	Definite	Germany	Memleben	(Mania 1995), (Mania 1984), (Weber 1977)
LMP	Definite	Definite	Germany	Bilzingsleben II	(Mania 1990), (Mania 1988)
LMP	Definite	Definite	Germany	Wangen	(Mania 1995)
LMP	Definite	Definite	Germany	Karlich Seeufer	(Gaudzinski *et al.* 1998), (Gaudzinski *et al.* 1996)
LMP	Definite	Definite	Germany	Wallendorf	(Mania 1995), (Mania 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	Germany	Schoningen	(Thieme and Maier 1995)
LMP	Definite	Definite	Israel	Evron	(Bar-Yosef 1994), (Bar-Yosef 1998), (Tchernov *et al.* 1994), (Horowitz 1989), (Ron *et al.* 2003)
LMP	Definite	Definite	Israel	Tabun F and G	(Mercier *et al.* 1995), (Jelinek 1982), (Horwitz and Tchernov 1989)
LMP	Definite	Definite	Israel	Umm Qatafa	(Bar-Yosef 1998), (Tchernov 1988), (Perrot 1992), (Horwitz and Tchernov 1989)
LMP	Definite	Definite	Israel	Holon	(Yizraeli 1967), (Chazan 2000), (Porat *et al.* 1999), (Bar-Yosef 1998)
LMP	Definite	Definite	Italy	Pontecorvo	(Biddittu and Cassoli 1968)
LMP	Definite	Definite	Italy	Visogliano B	(Cattani *et al.* 1991), (Mallegni *et al.* 2002)
LMP	Definite	Definite	Italy	Gargano	(Galiberti and Calboli 1992), (Palma di Cesnola 1975)
LMP	Definite	Definite	Italy	Monte Conero level I	(Abbazzi *et al.* 2000), (Peretto and Scarpante 1982)
LMP	Definite	Definite	Jordan	Upper Zarqa Bire formation	(Copeland and Hours 1988)
LMP	Definite	Definite	Portugal	Mealhada	(Raposo and Santonja 1995), (Antunes *et al.* 1988), (Penalva 1987)
LMP	Definite	Definite	Russian Federation	Treugol'naja Cave 5v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Definite	Definite	Russian Federation	Treugol'naja Cave 4	(Ljubin and Bosinski 1995), (Lioubine 2002), (Doronichev 2000a), (Hoffecker *et al.* 2003)
LMP	Definite	Definite	Russian Federation	Treugol'naja Cave 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
LMP	Definite	Definite	Russian Federation	Treugol'naja Cave 5a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
LMP	Definite	Definite	Syria	Roudo	(Sanlaville 1979)
LMP	Definite	Definite	Syria	Jabal Souayate	(Sanlaville 1979)
LMP	Definite	Probable	Germany	Kochstedt	(Mania 1995)
LMP	Definite	Probable	Germany	Bilzingsleben I	(Mania 1990)
LMP	Probable	Definite	Azerbaijan	Azych layer VI	(Ljubin and Bosinski 1995), (Lioubine 2002)
LMP	Probable	Definite	Denmark	Vejstrup Skv	(Holm 1986)
LMP	Probable	Definite	Egypt	Dakhla oasis	(Wendorf and Schild 1980), (Churcher *et al.* 1999)
LMP	Probable	Definite	England	Bembridge raised beach	(Preece and Scource 1987)
LMP	Probable	Definite	England	Limpsfield Common	(Wymer 1999)
LMP	Probable	Definite	England	Ridlands Farm	(Wymer 1999), (Roe 1968)
LMP	Probable	Definite	England	Biddenham	(Wymer 1999)
LMP	Probable	Definite	France	Menez-Dregan 1	
LMP	Probable	Definite	France	La Nauterie layer 11	(Bonifay 1996), (Prat and Thibault 1976)
LMP	Probable	Definite	France	Ailly-sur-Somme	(Tuffreau 1976), (Agache 1971)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Definite	France	Aldene I	(Bonifay 1996), (Renault-Miskovsky 1995), (Villa 1983), (Lécolle 1982), (Baïssas 1972), (Barral and Simone 1972)
LMP	Probable	Definite	France	Cap Sizun (Plouhinec)	(Monnier and Molines 1993)
LMP	Probable	Definite	France	Chaubard	(Tavoso 1973)
LMP	Probable	Definite	France	Lunel-Viel / Mas des Caves	(Bonifay 1996), (Bonifay 1991), (Villa 1983), (de Lumley 1975), (Bonifay 1976), (Bonifay 1968)
LMP	Probable	Definite	France	Montmaurin, La Terrasse 2	(Villa 1983), (Girard 1976)
LMP	Probable	Definite	France	La Llabanere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
LMP	Probable	Definite	France	Saint-Colomban	(Monnier 1988), (Monnier and Le Cloirec 1985)
LMP	Probable	Definite	France	Grotte Vaufrey c.11-13	(Geneste *et al.* 1991)
LMP	Probable	Definite	France	Montauban	(Tavoso 1976b)
LMP	Probable	Definite	France	Artenac	(Tournepiche 1984)
LMP	Probable	Definite	Georgia	Tsona level 7	(Ljubin and Bosinski 1995), (Lioubine 2002)
LMP	Probable	Definite	Georgia	Kudaro III level 7	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
LMP	Probable	Definite	Georgia	Kudaro I level 5 v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
LMP	Probable	Definite	Georgia	Kudaro I level 5 a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Definite	Georgia	Kudaro III level 5	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
LMP	Probable	Definite	Georgia	Tsona level 6	(Ljubin and Bosinski 1995), (Lioubine 2002)
LMP	Probable	Definite	Georgia	Kudaro I level 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
LMP	Probable	Definite	Georgia	Kudaro III level 6	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
LMP	Probable	Definite	Hungary	Vertesszollos	(Valoch 1995), (Kretzoi and Vertes 1965), (Kretzoi and Dobosi 1990)
LMP	Probable	Definite	Israel	Evron-Zinat / Oumm Zinat	(Gilead and Ronen 1977), (Bar-Yosef 1998), (Horwitz and Tchernov 1989)
LMP	Probable	Definite	Israel	Nahal Zihor group 2	(Ginat *et al.* 2003)
LMP	Probable	Definite	Italy	Bibbona	(Mussi 1995), (Peretto 1995), (Galiberti 1982), (Piperno *et al.* 1984)
LMP	Probable	Definite	Italy	Le Svolte	(Radmilli 1964), (Piperno *et al.* 1984)
LMP	Probable	Definite	Italy	Ceprano	(Ascenzi *et al.* 1996), (Ascenzi and Segre 1997), (Piperno *et al.* 1984)
LMP	Probable	Definite	Italy	Venosa-Loreto level B	(Mussi 1995), (Milliken 1997)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Definite	Italy	Visogliano A	(Mussi 1995), (Villa 2001), (Abbazzi *et al.* 2000), (Milliken 1997), (Falguères 2003), (Cattani *et al.* 1991), (Mallegni *et al.* 2002)
LMP	Probable	Definite	Italy	Grotta Paglicci	(Mussi 1995), (Mezzena and Palma di Cesnola 1971), (Palma di Cesnola 1975)
LMP	Probable	Definite	Italy	Fontana Ranuccio	(Mussi 1995), (Biddittu *et al.* 1979), (Segre and Ascenzi 1984)
LMP	Probable	Definite	Italy	Marina di Camerota	(Piperno *et al.* 1984)
LMP	Probable	Definite	Italy	Collinaia	(Mussi 1995), (Sarti and Stoduti 1982)
LMP	Probable	Definite	Moldavia	Dubossary	(Praslov 1995), (Anisssutkine 1987)
LMP	Probable	Definite	Moldavia	Pogreby	(Praslov 1995), (Anisssutkine 1987)
LMP	Probable	Definite	Morocco	Cap Chatelier	(Raynal *et al.* 1995b)
LMP	Probable	Definite	Morocco	Fez, Ben Souda quarry	(Onoratini *et al.* 1990)
LMP	Probable	Definite	Spain	Bolomor	(Raposo and Santonja 1995), (Fernández Peris *et al.* 1997)
LMP	Probable	Definite	Spain	La Maya III	(Raposo and Santonja 1995), (Santonja and Villa 1990)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Definite	Spain	Cau d'en Borras	(Raposo and Santonja 1995), (Fernandez-Peris and Villaverde 1996), (Carbonell Roura 1992), (Gusi *et al.* 1982), (Carbonell *et al.* 1979)
LMP	Probable	Definite	Spain	Pinedo	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Giles Pacheco and Pérez 1987), (Santonja 1996), (Moloney 1996), (Querol and Santonja 1979), (Querol 1984)
LMP	Probable	Definite	Spain	Budino	(Santonja and Villa 1990)
LMP	Probable	Definite	Spain	Cuesta de la Bajada	(Santonja 1996), (Santonja *et al.* 1992)
LMP	Probable	Definite	Spain	La Maya II	(Santonja and Villa 1990)
LMP	Probable	Definite	Spain	El Sartalejo	(Raposo and Santonja 1995), (Moloney 1992), (Querol 1984)
LMP	Probable	Definite	Spain	Atapuerca TD10	(Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002)
LMP	Probable	Definite	Spain	Majarromaque	(Giles Pacheco *et al.* 1996)
LMP	Probable	Definite	Spain	Atapuerca TD11	(Aldhouse-Green 1995), (Lopez Antonanzas and Cuenca Bescos 2002)
LMP	Probable	Definite	Spain	Sima de los Huesos	(Arsuaga *et al.* 1999), (Bischoff *et al.* 2003), (Bischoff *et al.* 1997), (Garcia *et al.* 1997)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Definite	Syria	Jrabiyat 4	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Tell Khasselate 2	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Jrabiyat 2	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Saene et-Tinat	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Tahun Semaan 2 & 3	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Aacharne Plain	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Jrabiyat 3	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Jrabiyat 6	(Muhesen 1993)
LMP	Probable	Definite	Syria	Dahr el Ayani	(Sanlaville 1979)
LMP	Probable	Definite	Syria	Hama 3	(Copeland and Hours 1993)
LMP	Probable	Definite	Syria	Nadaouiyeh 1	(Bar-Yosef 1998), (Le Tensorer *et al.* 1993), (Hours *et al.* 1983)
LMP	Probable	Definite	Syria	Hanifa	(Copeland and Hours 1993)
LMP	Probable	Definite	Turkey	Karain	(Otte *et al.* 1998b), (Yalçinkaya *et al.* 1992)
LMP	Probable	Definite	Turkey	Yarimburgaz	(Darlas 1995), (Farrand 1995), (Kuhn *et al.* 1998), (Kuhn *et al.* 1996)
LMP	Probable	Definite	Ukraine	Korolevo VII	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
LMP	Probable	Definite	Ukraine	Korolevo VI	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
LMP	Probable	Probable	Czech Republic	Becov 2	(Fridrich 1976)

Date	Date Probability	Probability	Country	Site Name	Reference
LMP	Probable	Probable	France	Poirier d'Armenstein	(Morin and Jacquemot 1976)
LMP	Probable	Probable	Holland	Kwintelooijen	(Peeters *et al.* 1988a)
LMP	Probable	Probable	Italy	Quinzano	(Radmilli 1976), (Cremaschi and Peretto 1988a)
LMP	Probable	Probable	Poland	Trzebnica	(Valoch 1995)
LMP	Probable	Probable	Russia	Chrjasci level 24	(Praslov 1995)
LMP	Probable	Probable	Spain	Cau del Duc cave	(Raposo and Santonja 1995), (Santonja 1996), (Carbonell Roura 1992), (Santonja and Villa 1990)

The oxygen isotope stages.

Date	Date Probability	Probability	Country	Site Name	Reference
OI 25	Probable	Unlikely	Italy	Monte Peglia	(Mussi 1995), (Peretto 1995), (Radmilli 1976), (van der Meulen 1973), (Piperno *et al.* 1984)
OI 23	Probable	Probable	Turkey	Dursunlu	(Güleç *et al.* 1999)
OI 23	Probable	Unlikely	Germany	Karlich A	(Bosinski 1995b), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988)
OI 22	Probable		Spain	Atapuerca TD5	(Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002)
OI 22	Probable	Unlikely	Spain	Atapuerca TD4	(Raposo and Santonja 1995), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Turner 1995)
OI 21	Probable	Definite	Czech Republic	Stare Mesto 1, series 1	(Chlachula 1994), (Chlachula 1993)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 21	Probable	Definite	Spain	Atapuerca TD6	(Raposo and Santonja 1995), (Mosquera Martinez 1996), (Bermudez de Castro *et al.* 1999), (Falgueres *et al.* 1999), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Diez *et al.* 1999), (Falguères 2003), (Garcia and Arsuaga 1999), (van der Made 1999)
OI 21	Probable	Probable	Russia	Gerasimovka	(Praslov 1995)
OI 21	Probable	Probable	Turkey	Dursunlu	(Güleç *et al.* 1999)
OI 21	Probable	Unlikely	Azerbaijan	Azych layers X-VII	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 21	Probable	Unlikely	Czech Republic	Brno-Cerveny Kopec	(Valoch 1995), (Valoch 1996b)
OI 21	Probable	Unlikely	Georgia	Achalkalaki	(Ljubin and Bosinski 1995), (Gabunia 2000), (Tappen *et al.* 2002)
OI 21	Probable	Unlikely	Germany	Karlich B1	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Würges 1986), (Kulemeyer 1988)
OI 20	Probable	Unlikely	Georgia	Achalkalaki	(Ljubin and Bosinski 1995), (Gabunia 2000), (Tappen *et al.* 2002)
OI 19	Probable	Definite	Algeria	Ternifine / Tighenif	(Raynal *et al.* 2001), (Geraads *et al.* 1986), (Jaeger 1975), (Balout *et al.* 1967)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 19	Probable	Definite	Israel	Gesher Benot Ya'aqov	(Bar-Yosef 1994), (Bar-Yosef 1998), (Tchernov *et al.* 1994), (Saragusti and Goren-Inbar 2001), (Horowitz 1989), (Goren-Inbar *et al.* 1994), (Goren-Inbar *et al.* 2000)
OI 19	Probable	Definite	Italy	Bel Poggio	(Fontana *et al.* 1998)
OI 19	Probable	Definite	Italy	Podere Canestri / Forlimpopoli	(Aldini *et al.* 1998)
OI 19	Probable	Definite	Italy	Fornace	(Fontana *et al.* 1998)
OI 19	Probable	Definite	Italy	Ca' Poggio	(Fontana *et al.* 1998)
OI 19	Probable	Definite	Spain	Guadalquivir valley T6	(Raposo and Santonja 1995)
OI 19	Probable	Definite	Spain	Atapuerca TD6	(Raposo and Santonja 1995), (Mosquera Martinez 1996), (Bermudez de Castro *et al.* 1999), (Falgueres *et al.* 1999), (Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002), (Falguères 2003), (Garcia and Arsuaga 1999), (van der Made 1999)
OI 19	Probable	Definite	Spain	Perilla del Castro	(Santonja and Villa 1990), (Giles Pacheco *et al.* 1996)
OI 19	Probable	Probable	Germany	Koblenz	(von Berg and Fiedler 1983), (Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Wegner and Ament 1986)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 19	Probable	Probable	Italy	Pagliare di Sassa	
OI 19	Probable	Probable	Russia	Gerasimovka	(Praslov 1995)
OI 19	Probable	Unlikely	Azerbaijan	Azych layers X-VII	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 19	Probable	Unlikely	Czech Republic	Beroun A I	(Valoch 1995), (Fridrich 1991a)
OI 19	Probable	Unlikely	Georgia	Achalkalaki	(Ljubin and Bosinski 1995), (Gabunia 2000), (Tappen *et al.* 2002)
OI 19	Probable	Unlikely	Germany	Karlich B2	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
OI 19	Probable	Unlikely	Russian Federation	Cimbal (Taman peninsula)	(Ljubin and Bosinski 1995), (Bonifay 1980)
OI 18	Probable	Definite	Italy	Isernia La Pineta II t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
OI 18	Probable	Definite	Italy	Isernia La Pineta I t.3a	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995a), (Sevink *et al.* 1981), (Giusberti and Peretto 1991)
OI 18	Probable	Definite	Italy	Isernia La Pineta I t.3c	(Mussi 1995), (Peretto 1995), (Villa 2001), (Milliken 1997), (Cremaschi and Peretto 1988b)
OI 18	Probable	Definite	Italy	Isernia La Pineta 3S10	(Villa 2001), (Milliken 1997), (Anconetani *et al.* 1995b)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 17	Probable	Definite	Algeria	Ternifine / Tighenif	(Raynal *et al.* 2001), (Geraads *et al.* 1986), (Jaeger 1975), (Balout *et al.* 1967)
OI 17	Probable	Probable	Czech Republic	Svedske sance	(Valoch 1995), (Valoch 1996b)
OI 17	Probable	Probable	France	Vidauban	(Defleur *et al.* 1991)
OI 17	Probable	Probable	Italy	Pagliare di Sassa	
OI 17	Probable	Unlikely	Czech Republic	Cernovice	(Valoch 1995)
OI 17	Probable	Unlikely	France	Montieres, Ferme de Grace	(Bourdier 1976b), (Munaut 1988), (Bourdier *et al.* 1974b), (Agache 1963)
OI 15	Definite	Definite	France	Carriere Carpentier	
OI 15	Definite	Definite	Russian Federation	Treugol'naja Cave 7a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
OI 15	Probable	Definite	Azerbaijan	Azych layer VI	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 15	Probable	Definite	Czech Republic	Stare Mesto I, series 2	(Chlachula 1994), (Chlachula 1993)
OI 15	Probable	Definite	England	Waverley Wood	(Roberts *et al.* 1995), (Shotten *et al.* 1993)
OI 15	Probable	Definite	France	l'Escale G	(Bonifay 1996), (Bonifay 1991), (de Lumley 1975), (Bonifay and Bonifay 1963)
OI 15	Probable	Definite	France	Soleilhac	(Raynal *et al.* 1995a), (Bonifay 1996), (Bonifay 1991), (Bracco 1991), (Fosse and Bonifay 1991), (Thouveny and Bonifay 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 15	Probable	Definite	France	Butte Four	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 15	Probable	Definite	France	Ternere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 15	Probable	Definite	France	Rodes	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 15	Probable	Definite	Georgia	Kudaro III level 8a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 15	Probable	Definite	Georgia	Kudaro I level 5 v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 15	Probable	Definite	Germany	Miesenheim 1	(Turner 2000b), (Vollbrecht 1997)
OI 15	Probable	Definite	Italy	Quarto delle Cinfonare	(Milliken *et al.* 1998), (Peretto *et al.* 1997)
OI 15	Probable	Probable	Czech Republic	Cernovice	(Valoch 1995)
OI 15	Probable	Probable	Czech Republic	Becov site I-B layer II	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
OI 15	Probable	Probable	Czech Republic	Becov site I-B layer III	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
OI 15	Probable	Probable	Czech Republic	Becov site I-B Layer 1	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
OI 15	Probable	Probable	Czech Republic	Svedske sance	(Valoch 1995), (Valoch 1996b)
OI 15	Probable	Probable	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1989), (Valoch 1996b)
OI 15	Probable	Probable	Czech Republic	Stranska Skala I	(Valoch 1995)
OI 15	Probable	Probable	England	Pakefield	(Stuart 1996), (Stuart and Lister 2000)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 15	Probable	Probable	England	Westbury-sub-Mendip	(Roberts *et al.* 1995), (Stringer *et al.* 1996), (Roe 1981), (Bishop 1975), (Andrews *et al.* 1999)
OI 15	Probable	Probable	Russian Federation	Treugol'naja Cave 7b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
OI 15	Probable	Unlikely	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1991b), (Valoch 1996b)
OI 14	Probable	Definite	Georgia	Kudaro III level 8	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 14	Probable	Definite	Germany	Karlich G	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
OI 13	Definite		England	High Lodge bed E	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)
OI 13	Definite	Definite	England	High Lodge bed C1	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)
OI 13	Definite	Definite	England	High Lodge bed C2	(Ashton *et al.* 1992), (Roberts *et al.* 1995), (Cook *et al.* 1991)
OI 13	Definite	Definite	England	Boxgrove unit 5a	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
OI 13	Definite	Definite	England	Boxgrove unit 4c&d	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Definite	Definite	England	Boxgrove unit 4b	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
OI 13	Definite	Definite	England	Boxgrove unit 3	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
OI 13	Definite	Definite	England	High Lodge bed B	(Roberts *et al.* 1995), (Cook *et al.* 1991), (Ashton *et al.* 1992)
OI 13	Definite	Definite	England	Slindon	(Woodcock 1986), (Wymer 1999), (Roe 1968)
OI 13	Definite	Definite	Germany	Mauer	(Vollbrecht 1995b)
OI 13	Definite	Probable	England	Wivenhoe	(Roberts *et al.* 1995), (Bridgland 1994)
OI 13	Probable	Definite	Azerbaijan	Azych layer VI	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 13	Probable	Definite	Czech Republic	Stare Mesto I, series 2	(Chlachula 1994), (Chlachula 1993)
OI 13	Probable	Definite	England	Feltwell, Shrub Hill	(Wymer 2001), (Wymer 1999), (Roe 1968), (Wymer 1985)
OI 13	Probable	Definite	England	Waverley Wood farm pit	(Roberts *et al.* 1995), (Shotten *et al.* 1993)
OI 13	Probable	Definite	England	High Lodge bed D	(Roberts *et al.* 1995), (Ashton *et al.* 1992), (Cook *et al.* 1991)
OI 13	Probable	Definite	England	Warren Hill	(Roberts *et al.* 1995), (Wymer *et al.* 1991), (Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Kent's Cavern	(Roberts *et al.* 1995), (Cook and Jacobi 1998), (Roe 1968), (Roe 1981), (Campbell and Sampson 1971)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Definite	England	Hockwold	(Wymer 1999), (Wymer 1985), (Roe 1968)
OI 13	Probable	Definite	England	Lakenheath	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Brandon	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Straits Mill	(Wymer 1999)
OI 13	Probable	Definite	England	Notley Road Pit	(Wymer 1999), (Roe 1968), (Wymer 1985)
OI 13	Probable	Definite	England	Sweetings Farm	(Wymer 1999), (Roe 1968), (Wymer 1985)
OI 13	Probable	Definite	England	Bembridge raised beach	(Preece and Scource 1987)
OI 13	Probable	Definite	England	Highlands Farm	(Gibbard and Wymer 1983), (Bridgland 1994), (Roe 1968)
OI 13	Probable	Definite	England	Kennylands	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Fordwich	(Bridgland *et al.* 1998a), (White 1998), (Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Wolvey	(Wymer 1999)
OI 13	Probable	Definite	England	Farnham terrace A	(Wymer 1999), (Roe 1981)
OI 13	Probable	Definite	England	Farthingworth Green	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Sulham	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Brimpton	(Wymer 1999)
OI 13	Probable	Definite	England	Wasing	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Wash Common, Newbury	(Wymer 1999), (Bridgland 1994), (Roe 1968)
OI 13	Probable	Definite	England	Greenham	(Wymer 1999), (Bridgland 1994)
OI 13	Probable	Definite	England	Sulhampstead	(Wymer 1999), (Bridgland 1994), (Roe 1968)
OI 13	Probable	Definite	England	Hillingdon	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Hangar Lane	(Wymer 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Definite	England	Ridlands Farm	(Wymer 1999), (Roe 1968)
OI 13	Probable	Definite	England	Hampstead Marshall	(Gibbard and Wymer 1983), (Wymer 1999), (Bridgland 1994)
OI 13	Probable	Definite	France	Champ de Mars	
OI 13	Probable	Definite	France	Rodes	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	Soleilhac	(Raynal *et al.* 1995a), (Bonifay 1996), (Bonifay 1991), (Bracco 1991), (Fosse and Bonifay 1991), (Bonifay and Bonifay 1981), (Thouveny and Bonifay 1984)
OI 13	Probable	Definite	France	Saint-Acheul, rue Marcelin Berthelot	
OI 13	Probable	Definite	France	Menez-Dregan 1	
OI 13	Probable	Definite	France	Vergranne	(Bonifay 1996), (Thévenin 1991), (Vandermeersch and Tillier 1983), (Chaline 1983)
OI 13	Probable	Definite	France	La Nauterie layers 13/14	(Bonifay 1996), (Geneste *et al.* 1991), (Prat and Thibault 1976), (Paquereau 1976)
OI 13	Probable	Definite	France	Aldene J/K	(Bonifay 1996), (Bonifay 1991), (Renault-Miskovsky 1995), (Villa 1983), (Lécolle 1982), (Baïssas 1972), (Barral and Simone 1972)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Definite	France	Caune de l'Arago unit II	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley *et al.* 1988), (de Lumley *et al.* 1979)
OI 13	Probable	Definite	France	Cap Sizun (Plouhinec)	(Monnier and Molines 1993)
OI 13	Probable	Definite	France	Ternere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	Stade	(Bourdier 1974)
OI 13	Probable	Definite	France	Mas Romeu	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	La Llabanere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	Coll de la Guille	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	Artenac	(Tournepiche 1984)
OI 13	Probable	Definite	France	Butte Four	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 13	Probable	Definite	France	Grotte Vaufrey c.11-13	(Geneste *et al.* 1991)
OI 13	Probable	Definite	France	La Nauterie layer 11	(Bonifay 1996), (Prat and Thibault 1976), (Thibault 1976)
OI 13	Probable	Definite	France	Lunel-Viel / Mas des Caves	(Bonifay 1996), (Bonifay 1991), (Villa 1983), (de Lumley 1975), (Bonifay 1976), (Bonifay 1968)
OI 13	Probable	Definite	France	Montmaurin, La Terrasse 2	(Villa 1983), (Girard 1976)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Definite	France	Saint-Colomban	(Monnier 1988), (Monnier and Le Cloirec 1985)
OI 13	Probable	Definite	Georgia	Tsona level 7	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 13	Probable	Definite	Georgia	Kudaro I level 5 v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 13	Probable	Definite	Georgia	Kudaro III level 6	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 13	Probable	Definite	Georgia	Kudaro III level 7	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 13	Probable	Definite	Georgia	Kudaro I level 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 13	Probable	Definite	Germany	Miesenheim 1	(Turner 2000b)
OI 13	Probable	Definite	Germany	Karlich G	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
OI 13	Probable	Definite	Hungary	Vertesszollos	(Valoch 1995)
OI 13	Probable	Definite	Italy	Fontana Ranuccio	(Mussi 1995), (Milliken 1997), (Biddittu *et al.* 1979), (Segre and Ascenzi 1984)
OI 13	Probable	Definite	Italy	Ceprano	(Ascenzi *et al.* 1996), (Ascenzi and Segre 1997)
OI 13	Probable	Definite	Italy	Venosa-Loreto level A	(Mussi 1995), (Milliken 1997), (Caloi and Palombo 1979), (Barral and Simone 1983)
OI 13	Probable	Definite	Italy	Marina di Camerota	(Piperno *et al.* 1984)
OI 13	Probable	Definite	Italy	Cava Pompi	(Mussi 1995), (Piperno *et al.* 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Definite	Italy	Visogliano A	(Mussi 1995), (Villa 2001), (Abbazzi *et al.* 2000), (Milliken 1997), (Falguères 2003), (Cattani *et al.* 1991), (Mallegni *et al.* 2002)
OI 13	Probable	Definite	Italy	Venosa-Notarchirico alpha	(Mussi 1995), (Villa 2001), (Milliken 1997), (Belli *et al.* 1991)
OI 13	Probable	Definite	Spain	Laguna Medina	(Raposo and Santonja 1995), (Carbonell Roura 1992), (Giles Pacheco *et al.* 1993)
OI 13	Probable	Definite	Spain	Laguna Medina	(Raposo and Santonja 1995), (Carbonell Roura 1992), (Giles Pacheco *et al.* 1993)
OI 13	Probable	Definite	Spain	Pinedo	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Giles Pacheco and Pérez 1987), (Santonja 1996), (Moloney 1996), (Querol and Santonja 1979), (Querol 1984)
OI 13	Probable	Definite	Turkey	Karain	(Otte *et al.* 1998b), (Yalçinkaya *et al.* 1992)
OI 13	Probable	Probable	Belgium	La Belle-Roche	(Roebroeks 1986), (Cordy 1980), (Cahen 1984)
OI 13	Probable	Probable	Czech Republic	Cernovice	(Valoch 1995)
OI 13	Probable	Probable	Czech Republic	Becov site I-B layer III	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 13	Probable	Probable	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1989), (Valoch 1996b)
OI 13	Probable	Probable	Czech Republic	Becov site I-B layer II	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
OI 13	Probable	Probable	Czech Republic	Svedske sance	(Valoch 1995), (Valoch 1996b)
OI 13	Probable	Probable	Czech Republic	Stranska Skala I	(Valoch 1995), (Musil 1968, 1995)
OI 13	Probable	Probable	Czech Republic	Becov site I-B Layer 1	(Valoch 1995), (Fridrich 1976), (Fridrich 1989)
OI 13	Probable	Probable	England	Westbury-sub-Mendip	(Roberts *et al.* 1995), (Roe 1981), (Bishop 1975), (Andrews *et al.* 1999)
OI 13	Probable	Probable	England	Freeland	(Hardaker 2001)
OI 13	Probable	Probable	France	Hangenbieten	(Thévenin 1991), (de Lumley *et al.* 1988), (Wernert 1957)
OI 13	Probable	Probable	Germany	Achenheim Layer 30	(Vollbrecht 1995a), (Junkmanns 1995), (Thévenin 1991)
OI 13	Probable	Probable	Italy	Valchetta Cartoni	(Mussi 1995), (Blanc 1935)
OI 13	Probable	Probable	Poland	Trzebnica	(Valoch 1995)
OI 13	Probable	Unlikely	Czech Republic	Prezletice	(Valoch 1995), (Fridrich 1976), (Fridrich 1991b), (Valoch 1996b)
OI 12	Definite	Definite	England	St. George's Hill, Weybridge	(Wymer 1999)
OI 12	Definite	Definite	England	Tilehurst	(Wymer 1999), (Roe 1968)
OI 12	Definite	Definite	England	Maldon	(Bridgland 1994), (Roe 1968), (Wymer 1985)
OI 12	Definite	Definite	England	Boxgrove unit 11	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 12	Definite	Definite	England	Boxgrove units 6-8	(Roberts *et al.* 1995), (Parfitt 1998), (Roberts 1998), (Roberts and Parfitt 1999)
OI 12	Definite	Definite	France	Cagny-la Garenne unit 1	(Agache 1971), (Lamotte 2001)
OI 12	Definite	Definite	France	Cagny-la Garenne unit 2	(Bourdier *et al.* 1974a)
OI 12	Definite	Definite	Germany	Karlich H	(Bosinski 1995a), (Gaudzinski and Vollbrecht 1995), (Kulemeyer 1988), (Vollbrecht 1997)
OI 12	Probable		Spain	Torre del Puerco	(Giles Pacheco *et al.* 1996)
OI 12	Probable	Definite	Belgium	Pa d'la l'iau	(Lamotte 2001), (Cahen 1984)
OI 12	Probable	Definite	England	Englefield	(Gibbard and Wymer 1983), (Roe 1968)
OI 12	Probable	Definite	England	Wolvey	(Wymer 1999)
OI 12	Probable	Definite	England	Clacton Lower Freshwater Bed	(Roberts *et al.* 1995), (Wymer 1985), (Roe 1968)
OI 12	Probable	Definite	England	Warren Hill	(Roberts *et al.* 1995), (Wymer *et al.* 1991), (Wymer 1999), (Roe 1968), (Wymer 1985)
OI 12	Probable	Definite	England	Kennylands	(Wymer 1999), (Roe 1968)
OI 12	Probable	Definite	England	Hillingdon	(Gibbard and Wymer 1983), (Roe 1968)
OI 12	Probable	Definite	England	Dartford Heath	(Gibbard and Wymer 1983), (Bridgland 1994), (Roe 1968)
OI 12	Probable	Definite	England	Wasing	(Wymer 1999), (Roe 1968)
OI 12	Probable	Definite	England	Farthingworth Green	(Wymer 1999), (Roe 1968)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 12	Probable	Definite	England	Sulham	(Wymer 1999), (Roe 1968)
OI 12	Probable	Definite	England	Greenham	(Wymer 1999), (Bridgland 1994)
OI 12	Probable	Definite	England	Brimpton	(Wymer 1999), (Roe 1968)
OI 12	Probable	Definite	England	Highlands Farm	(Gibbard and Wymer 1983), (Bridgland 1994), (Roe 1968)
OI 12	Probable	Definite	England	Wash Common, Newbury	(Wymer 1999), (Bridgland 1994), (Roe 1968)
OI 12	Probable	Definite	England	Waverley Wood farm pit	(Roberts *et al.* 1995), (Shotten *et al.* 1993)
OI 12	Probable	Definite	England	Sulhamstead	(Bridgland 1998), (Bridgland 1994), (Roe 1968)
OI 12	Probable	Definite	England	Wallingford	(Gibbard and Wymer 1983), (Wymer 1999)
OI 12	Probable	Definite	England	Tidmarsh	(Gibbard and Wymer 1983), (Roe 1968)
OI 12	Probable	Definite	France	Artenac	(Tournepiche 1984)
OI 12	Probable	Definite	France	Caune de l'Arago unit III	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley *et al.* 1988), (de Lumley *et al.* 1979)
OI 12	Probable	Definite	Georgia	Kudaro III level 8	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 12	Probable	Definite	Georgia	Kudaro I level 5 a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 12	Probable	Definite	Georgia	Kudaro III level 5	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 12	Probable	Definite	Spain	Laguna Medina	(Raposo and Santonja 1995), (Giles Pacheco *et al.* 1996)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 12	Probable	Definite	Spain	Torralba	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Ortega Martinez 1992), (Carbonell *et al.* 1987), (Freeman and Butzer 1966), (Santonja 1996), (Shipman and Rose 1983), (Perez-Gonzalez *et al.* 1999)
OI 12	Probable	Definite	Spain	Ambrona lower occupation	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Santonja 1996), (Shipman and Rose 1983), (Perez-Gonzalez *et al.* 1999), (Villa 1983)
OI 12	Probable	Definite	Turkey	Karain	(Otte *et al.* 1998b), (Yalçinkaya *et al.* 1992)
OI 12	Probable	Definite	Ukraine	Korolevo VII	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
OI 12	Probable	Probable	Czech Republic	Becov 2	(Fridrich 1976)
OI 12	Probable	Probable	Ukraine	Korolevo VIII	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
OI 11	Definite	Definite	England	Swanscombe Lower Middle Gravel	(Roberts *et al.* 1995), (Roe 1968)
OI 11	Definite	Definite	England	Swanscombe Lower Loam	(Roberts *et al.* 1995), (Roe 1968), (Conway *et al.* 1996)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Definite	Definite	England	Swanscombe Lower Gravel	(Roberts *et al.* 1995), (Roe 1968)
OI 11	Definite	Definite	England	Wilmington	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Chadwell St. Mary	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Swanscombe Upper Middle Gravel	(Roberts *et al.* 1995), (Roe 1968)
OI 11	Definite	Definite	England	Barnham unit 5c	(Roberts *et al.* 1995), (Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Dartford	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Stonehall Farm Pits, Redbridge	(Wymer 1999)
OI 11	Definite	Definite	England	Cooper's Pit	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Deverill's Pit	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Burnham	(Wymer 1999), (Roe 1981)
OI 11	Definite	Definite	England	Elveden palaeosol area III	(Ashton *et al.* 2000a), (Wymer 1985), (Paterson and Fagg 1940)
OI 11	Definite	Definite	England	Swanscombe Upper Loam	(Roberts *et al.* 1995), (Roe 1968)
OI 11	Definite	Definite	England	Ingress Vale	(Wymer 1999), (Bridgland 1994), (Roe 1968)
OI 11	Definite	Definite	England	Barnham unit 7	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Barnham unit 6	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Shakespeare Farm Pit, St. Mary's Hoo	(Wymer 1999)
OI 11	Definite	Definite	England	Barnham unit 5e	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Barnham unit 5d	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Definite	Definite	England	Burnham-on-Crouch	(Bridgland 1994), (Roe 1968)
OI 11	Definite	Definite	England	Barnham unit 4	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Barnham unit 3	(Ashton *et al.* 2000b), (Ashton *et al.* 1998)
OI 11	Definite	Definite	England	Winch's Pit, near Maidenhead	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Beeches Pit bed 5-6	(Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991), (Roberts *et al.* 1995)
OI 11	Definite	Definite	England	Hoxne stratum E	(Roberts *et al.* 1995), (Lewis *et al.* 2000), (Singer *et al.* 1993), (Schreve 2000), (Wymer 1985)
OI 11	Definite	Definite	England	Aldingbourne	(Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Swanscombe Upper Gravel	(Roberts *et al.* 1995), (Roe 1968)
OI 11	Definite	Definite	England	Hoxne stratum C	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
OI 11	Definite	Definite	England	Beeches Pit bed 7	(Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991), (Roberts *et al.* 1995)
OI 11	Definite	Definite	England	Clacton Upper Freshwater Bed	(Roberts *et al.* 1995), (Wymer 1985), (Roe 1968)
OI 11	Definite	Definite	England	Beeches Pit bed 3	(Roberts *et al.* 1995), (Gowlett and Hallos 2000), (Preece *et al.* 2000), (Preece *et al.* 1991)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Definite	Definite	England	Beeches Pit bed 4	(Roberts *et al.* 1995), (Preece *et al.* 1991), (Gowlett and Hallos 2000), (Preece *et al.* 2000)
OI 11	Definite	Definite	England	Hoxne bed 5	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
OI 11	Definite	Definite	England	Hitchin	(Ashton *et al.* 2000b), (Wymer 1999), (Roe 1968)
OI 11	Definite	Definite	England	Elveden lag gravel	(Ashton *et al.* 2000a), (Wymer 1985), (Paterson and Fagg 1940)
OI 11	Definite	Definite	England	Elveden brickearth	(Ashton *et al.* 2000a), (Paterson and Fagg 1940)
OI 11	Definite	Definite	England	Hoxne bed 4	(Lewis *et al.* 2000), (Schreve 2000), (Singer *et al.* 1993)
OI 11	Definite	Definite	France	Saint-Acheul, rue de Cagny white sands	
OI 11	Definite	Definite	France	Mautort	(Tuffreau 1976)
OI 11	Definite	Definite	France	Cagny-Cimetiere	(Moigne 1988), (Bourdier *et al.* 1974a), (Tuffreau *et al.* 1982)
OI 11	Definite	Definite	France	Cagny-la Garenne unit 3/4	(Bourdier *et al.* 1974a), (Lamotte 2001)
OI 11	Definite	Definite	France	Saint-Acheul, rue de Cagny gravels	(Tuffreau *et al.* 1982), (Commont 1908)
OI 11	Definite	Definite	Germany	Karlich Seeufer	(Gaudzinski *et al.* 1998), (Gaudzinski *et al.* 1996)
OI 11	Definite	Definite	Germany	Bilzingsleben II	(Mania 1990), (Mania 1988)
OI 11	Definite	Definite	Russian Federation	Treugol'naja Cave 5v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Definite	Definite	Russian Federation	Treugol'naja Cave 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
OI 11	Definite	Probable	Germany	Bilzingsleben I	(Mania 1990)
OI 11	Probable		France	l'Igue des Rameaux	(Bonifay 1996)
OI 11	Probable	Definite	Albania	Gajtan	(Darlas 1995), (Fistani 1993a), (Fistani 1993b)
OI 11	Probable	Definite	Azerbaijan	Azych layer VI	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 11	Probable	Definite	Azerbaijan	Azych layer V	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 11	Probable	Definite	Denmark	Vejstrup Skv	(Holm 1986)
OI 11	Probable	Definite	England	Clacton Lower Freshwater Bed	(Roberts *et al.* 1995), (Wymer 1985), (Roe 1968)
OI 11	Probable	Definite	England	Foxhall Road, Ipswich	(Wymer 1999), (Roe 1968), (Wymer 1985)
OI 11	Probable	Definite	England	Ridlands Farm	(Wymer 1999), (Roe 1968)
OI 11	Probable	Definite	England	Cuxton	(Wymer 1999), (Roe 1981)
OI 11	Probable	Definite	England	Sturry	(White 1998), (Bridgland *et al.* 1998b), (Wymer 1999), (Roe 1968)
OI 11	Probable	Definite	England	Mark's Tey	(Wymer 1999), (Wymer 1985)
OI 11	Probable	Definite	England	Hanborough	(Bridgland 1994), (Roe 1968)
OI 11	Probable	Definite	England	Farnham terrace A	(Wymer 1999), (Roe 1981)
OI 11	Probable	Definite	England	Wood Green	(Bridgland and Harding 1987), (Wymer 1999), (Roe 1968)
OI 11	Probable	Definite	England	Bembridge raised beach	(Preece and Scource 1987)
OI 11	Probable	Definite	England	Red Barns, Portchester	(Gamble and ApSimon 1986)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Probable	Definite	England	Barton Cliffs	(Bridgland 2001), (Roe 1968)
OI 11	Probable	Definite	England	Biddenham	(Wymer 1999)
OI 11	Probable	Definite	England	Devereux's Pit, Icklingham	(Lewis 1998)
OI 11	Probable	Definite	England	Orton Longueville / Hicks Brickyard	(Davey 1991), (Wymer 1999)
OI 11	Probable	Definite	France	Toulinet	(Monnier 1982)
OI 11	Probable	Definite	France	Teviec	(Monnier 1982)
OI 11	Probable	Definite	France	Port-Pignot	(Michel 1982)
OI 11	Probable	Definite	France	Artenac	(Tournepiche 1984)
OI 11	Probable	Definite	France	Aldene I	(Bonifay 1996), (Renault-Miskovsky 1995), (Villa 1983), (Lécolle 1982), (Baïssas 1972), (Barral and Simone 1972)
OI 11	Probable	Definite	France	Cap Sizun (Plouhinec)	(Monnier and Molines 1993)
OI 11	Probable	Definite	France	Grotte Vaufrey couche XII	(Rigaud 1989)
OI 11	Probable	Definite	France	Montfarville	(Michel 1982)
OI 11	Probable	Definite	France	La Llabanere	(Villa 1983), (de Lumley *et al.* 1988), (Collina-Girard 1978)
OI 11	Probable	Definite	France	Terra Amata	(Renault-Miskovsky 1995), (Villa 1983), (de Lumley 1975), (de Lumley 1966)
OI 11	Probable	Definite	France	La Micoque unit A/layer 1	(Falgueres *et al.* 1997), (Laville 1975), (Guichard 1976)
OI 11	Probable	Definite	France	Montmaurin, La Terrasse 2	(Villa 1983), (Girard 1976)
OI 11	Probable	Definite	France	La Micoque unit C/layer 2	(Falgueres *et al.* 1997), (Guichard 1976)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Probable	Definite	France	Lunel-Viel / Mas des Caves	(Bonifay 1996), (Bonifay 1991), (Villa 1983), (de Lumley 1975), (Bonifay 1976), (Bonifay 1968)
OI 11	Probable	Definite	France	Saint-Pierre-les-Elbeuf	(Fosse 1982)
OI 11	Probable	Definite	France	Grotte Vaufrey c.11-13	(Geneste *et al.* 1991)
OI 11	Probable	Definite	France	Salouel	(Tuffreau 1976)
OI 11	Probable	Definite	France	La Nauterie layer 11	(Bonifay 1996), (Prat and Thibault 1976)
OI 11	Probable	Definite	France	Ailly-sur-Somme	(Tuffreau 1976), (Agache 1971)
OI 11	Probable	Definite	France	Saline	(Michel 1982), (Verron 1977)
OI 11	Probable	Definite	France	Montmaurin, La Terrasse 1	(Villa 1983)
OI 11	Probable	Definite	France	Chasse Mitais a Equeurdre-ville	(Michel 1982)
OI 11	Probable	Definite	France	Saint-Colomban	(Monnier 1988), (Monnier and Le Cloirec 1985)
OI 11	Probable	Definite	France	Menez-Dregan 1	(Monnier and Molines 1993), (Hallegouet *et al.* 1992)
OI 11	Probable	Definite	Georgia	Tsona level 7	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 11	Probable	Definite	Georgia	Kudaro III level 6	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 11	Probable	Definite	Georgia	Kudaro III level 7	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 11	Probable	Definite	Georgia	Kudaro I level 5b	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Probable	Definite	Georgia	Kudaro I level 5 v	(Ljubin and Bosinski 1995), (Lioubine 2002), (Lubine *et al.* 1985)
OI 11	Probable	Definite	Georgia	Tsona level 6	(Ljubin and Bosinski 1995), (Lioubine 2002)
OI 11	Probable	Definite	Germany	Wangen	(Mania 1995)
OI 11	Probable	Definite	Germany	Memleben	(Mania 1995), (Mania 1984)
OI 11	Probable	Definite	Germany	Neumark sud	(Mania 1995), (Mania 1984)
OI 11	Probable	Definite	Germany	Reilingen	(Czarnetzki 1991)
OI 11	Probable	Definite	Germany	Schoningen	(Thieme and Maier 1995)
OI 11	Probable	Definite	Hungary	Vertesszollos	(Valoch 1995), (Kretzoi and Vertes 1965), (Kretzoi and Dobosi 1990)
OI 11	Probable	Definite	Israel	Tabun F and G	(Mercier *et al.* 1995), (Jelinek 1982), (Horwitz and Tchernov 1989)
OI 11	Probable	Definite	Italy	Visogliano A	(Mussi 1995), (Villa 2001), (Abbazzi *et al.* 2000), (Milliken 1997), (Falguères 2003), (Cattani *et al.* 1991), (Mallegni *et al.* 2002)
OI 11	Probable	Definite	Italy	Bibbona	(Mussi 1995), (Peretto 1995), (Galiberti 1982), (Piperno *et al.* 1984)
OI 11	Probable	Definite	Italy	Venosa-Loreto level B	(Mussi 1995), (Milliken 1997)
OI 11	Probable	Definite	Italy	Fontana Ranuccio	(Mussi 1995), (Biddittu *et al.* 1979), (Segre and Ascenzi 1984)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Probable	Definite	Italy	Ceprano	(Ascenzi *et al.* 1996), (Ascenzi and Segre 1997), (Piperno *et al.* 1984)
OI 11	Probable	Definite	Italy	Collinaia	(Mussi 1995), (Sarti and Stoduti 1982)
OI 11	Probable	Definite	Italy	Marina di Camerota	(Piperno *et al.* 1984)
OI 11	Probable	Definite	Moldavia	Pogreby	(Praslov 1995), (Anisssutkine 1987)
OI 11	Probable	Definite	Moldavia	Dubossary	(Praslov 1995), (Anisssutkine 1987)
OI 11	Probable	Definite	Russian Federation	Treugol'naja Cave 5a	(Ljubin and Bosinski 1995), (Lioubine 2002), (Hoffecker *et al.* 2003)
OI 11	Probable	Definite	Spain	Atapuerca TD10	(Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002)
OI 11	Probable	Definite	Spain	Atapuerca TD11	(Carbonell *et al.* 1995b), (Lopez Antonanzas and Cuenca Bescos 2002)
OI 11	Probable	Definite	Spain	Sima de los Huesos	(Arsuaga *et al.* 1999), (Bischoff *et al.* 2003), (Bischoff *et al.* 1997), (Garcia *et al.* 1997)
OI 11	Probable	Definite	Spain	Majarroma-que	(Giles Pacheco *et al.* 1996)
OI 11	Probable	Definite	Spain	Bolomor	(Raposo and Santonja 1995), (Fernández Peris *et al.* 1997)

Date	Date Probability	Probability	Country	Site Name	Reference
OI 11	Probable	Definite	Spain	Pinedo	(Raposo and Santonja 1995), (Santonja and Villa 1990), (Giles Pacheco and Pérez 1987), (Santonja 1996), (Moloney 1996), (Querol and Santonja 1979), (Querol 1984)
OI 11	Probable	Definite	Turkey	Karain	(Otte *et al.* 1998b), (Yalçinkaya *et al.* 1992)
OI 11	Probable	Definite	Ukraine	Korolevo VI	(Valoch 1995), (Gladilin 1989), (Carbonell *et al.* 1995b), (Valoch 1996b), (Adamenko and Gladiline 1989)
OI 11	Probable	Probable	Germany	Kochstedt	(Mania 1995)
OI 11	Probable	Probable	Holland	Kwintelooijen	(Peeters *et al.* 1988a)
OI 11	Probable	Probable	Poland	Trzebnica	(Valoch 1995)
OI 11	Probable	Probable	Russia	Chrjasci level 24	(Praslov 1995)

Appendix Three: The Upper Palaeolithic sites.

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	Bosnia	Luscic	
>40	Definite	Croatia	Sandalja II f[-5-5.5m]	(Allsworth-Jones 1986)
>40	Definite	Croatia	Sandalja [III] e [-4.5-5m]	(Allsworth-Jones 1986)
>40	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
>40	Definite	France	La Salpetriere [Remoulins] 30 E	Radiocarbon 18: 81 (Lyon datelist 6). (Escalon de Fonton 1966) (Bazile 1984)
>40	Definite	France	La Ferrassie Els	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
>40	Definite	France	Solutre [O/A] 6 [sondage B]	Radiocarbon 15: 520 (Lyon datelist 4)
>40	Definite	France	La Ferrassie F	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
>40	Definite	France	Canecaude I [Villardonel] 3	(Sacchi 1976) Radiocarbon 24(3): 323.
>40	Definite	France	Abri Pataud 6	OxA datelist 5 (1987) (Movius 1975) (Rigaud 1991)
>40	Definite	France	Le Flageolet I [Bezenac] XI	(Rigaud 1976)
>40	Definite	France	La Salpetriere [Remoulins] 30 M	Radiocarbon 18: 81 (Lyon datelist 6). (Escalon de Fonton 1966) (Bazile 1984)
>40	Definite	France	La Ferrassie [Els] G1	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
>40	Definite	France	La Ferrassie F (Peyrony 1934)	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
>40	Definite	France	La Ferrassie K5	(Djindjian 1986) (Delporte 1984)
>40	Definite	Germany	Paderborn	(Allsworth-Jones 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	Moldavia	Climautsy II [in Lower Climautsi village, near mouth of one of the dextral bank Dniestr tributaries]	(Cohen and Stepanchuk 1999)
>40	Definite	Portugal	Lapa da Rainha 5	(Zilhão 1997)
>40	Definite	Romania	Ceahlau-Cetatica I	Paul Pettitt database (Honea 1986) (Chirica 1986)
>40	Definite	Romania	Ceahlau-Cetatica II	Paul Pettitt database (Honea 1986)
>40	Definite	Russia	Berdyzh 1	OxA datelist 5 (1987) (Soffer 1985)
>40	Definite	Spain	Labeko Koba V	
>40	Definite	Spain	L'Arbreda -4.85-4.95m [Level G]	(Canal i Roquet and Carbonell i Roura 1989b) (Canal i Roquet and Carbonell i Roura 1989e) (Bischoff *et al.* 1989) (Soler i Masferrer and Maroto i Genover 1987) (Maroto *et al.* 1996)
>40	Definite	Spain	Nerja basal	(Straus 1996)
>40	Definite	Spain	Labeko Koba IV	
>40	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
>40	Definite	Ukraine	Sagiadak I c.1 [1st loess]	Paul datelist (Cohen and Stepanchuk 1999)
>40	Probable	Austria	Alberndorf [in der Riedmark]	(Svoboda *et al.* 1996)
>40	Probable	Austria	Horn (Raberstrasse)	(Svoboda *et al.* 1996)
>40	Probable	Austria	Langmannersdorf A	(Allsworth-Jones 1986) (Svoboda *et al.* 1996) (Hahn 1977) (Hahn 1970)
>40	Probable	Belgium	Trou Magrite 3	(Otte and Straus 1995)
>40	Probable	Belgium	Trou Magrite 2	(Otte and Straus 1995)
>40	Probable	France	Solutre [O/A] "sondage C"	Radiocarbon 5: 64 (?63)
>40	Probable	Spain	Rascano Cave 7	Radiocarbon 24: 251 (British Museum datelist 14).
>40	Probable	Spain	La Riera 1 [26]	Radiocarbon 27: 444 (Lyon datelist 10).)(Straus and Clark 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Probable	Spain	La Riera 1 [26]	Radiocarbon 27: 444 (Lyon datelist 10) (Straus and Clark 1986)
>40	Probable	Spain	La Riera 1 [26]	Radiocarbon 27: 444 (Lyon datelist 10) (Straus and Clark 1986)
>40	Probable	Spain	La Riera 1 [26]	British Museum datelist 15 (Straus and Clark 1986)
>40	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 9 (1989) (Jacobi *et al.* 1998)
>40	Probable	U.K.	Paviland Cave [Goat's Hole] occupation horizon	(Aldhouse-Green and Pettitt 1998) (Swainston 2000) (Turner 2000a)
>40	Probable	Ukraine	Sagaidak I	Paul Pettitt database (Cohen and Stepanchuk 1999)
>40	Unlikely	Belgium	Goyet	(Toussaint *et al.* 1998) (Allsworth-Jones 1986)
>40	Unlikely	France	Gr des Fieux [Miers]	(Champagne *et al.* 1990)
>40	Unlikely	France	Pompertuzat loess I	
>40	Unlikely	Switzerland	Schnurenloch	GrN datelist 10: 55. (Jequier 1975)
>40	Unlikely	U.K.	Ogof-yr-Ichen, Caldey island	(Stuart 1982)
>40	Unlikely	U.K.	Robin Hood's Cave LSB: hearth C3 top	OxA datelist 3 (1986)
>40	Unlikely	U.K.	Picken's Hole, Layer 3	(Tratman 1964) (Stuart 1982)
>40		France	Igue de Barriere[s]	Radiocarbon 27: 397 (Lyon datelist 10)
>40		Romania	Climautsy I II	
>40		Romania	Climautsy II II	
>40	Definite	Austria	Willendorf II 2?/D1 mid.	GrN datelist 6: 97. (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
>40	Definite	Austria	Willendorf II 2/D1 up.	GrN datelist 6: 97. (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	Austria	Willendorf II 4/C4	GrN datelist 6: 97. (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
>40	Definite	Austria	Krems-Hundssteig brown layer	(Hahn 1977) (Broglio and Laplace 1966), (Strobl and Obermaier 1909) (Allsworth-Jones 1986) (Hahn 1970)
>40	Definite	Austria	Willendorf II 3/C8	(Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
>40	Definite	Belgium	Trou Al'Wesse L6/Ch15/F480/-543-647cm	(Otte *et al.* 1998a)
>40	Definite	Bulgaria	Temnata Cave TD-1/4C	(Kozlowski *et al.* 1982) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
>40	Definite	Bulgaria	Temnata Cave TD-V/4B	(Ginter *et al.* 1996) (Marambat 1992), (Guadelli and Delpech 1992)
>40	Definite	Bulgaria	Bacho Kiro 11	OxA datelist 18 (1994) (Kozlowski 1982)
>40	Definite	Bulgaria	Temnata Cave TD-1/4B	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
>40	Definite	Bulgaria	Temnata Cave TD-1/4A	(Kozlowski *et al.* 1982) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
>40	Definite	Bulgaria	Temnata Cave TD-V/4A	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992)
>40	Definite	Bulgaria	Bacho Kiro 6b	OxA datelist 18 (1994) (Kozlowski 1982)
>40	Definite	Croatia	Velika Pecina 2 I	GrN datelist 10: 60. (Karavanic 1995) (Karavanic 2000)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	Czech	Pod Hradem Cave A 8	GrN datelist 6: 102. (Valoch 1996a) (Allsworth-Jones 1986)
>40	Definite	Czech	Stranska-skala IIIb 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
>40	Definite	France	Roc de Combe [Nadaillac] 7b	OxA datelist 10 (1990) (Bordes and Labrot 1967) (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
>40	Definite	France	Abri Caminade [Caneda] G	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
>40	Definite	France	Esquicho-Grapaou SLC1A	(Bazile 1976) (Bazile 1984)
>40	Definite	France	Roc de Combe [Nadaillac] 7c	OxA datelist 10 (1990) (Bordes and Labrot 1967) (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
>40	Definite	France	A. Combe Sauniere [Sarliac-sur-l'Isle]	(Mellars 1999)
>40	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
>40	Definite	France	Abri Caminade [Caneda] D21	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
>40	Definite	France	Abri Pataud ??	(Movius 1975)
>40	Definite	France	Abri Pataud 14	(Movius 1975)
>40	Definite	France	Esquicho-Grapaou SLC 1B	(Bazile 1976) (Bazile 1984)
>40	Definite	France	Abri Pataud 12	(Movius 1975)
>40	Definite	France	Le Flageolet I [Bezenac] XI	(Zilhao and d'Errico 1999) (Rigaud 1976)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	France	Abri Pataud 7	(Movius 1975)
>40	Definite	France	Abri Caminade [Caneda] F	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
>40	Definite	France	La Ferrassie K6	(Djindjian 1986) (Delporte 1984)
>40	Definite	France	Isturitz [Isturits] U27, 4d	(Zilhao and d'Errico 1999) (Lévêque and Miskovsky 1983)
>40	Definite	France	Grotte du Renne, Arcy-sur-Cure VII	(Bailloud 1953) (Lévêque and Miskovsky 1983) (Leroi-Gourhan 1976) (Leroi-Gourhan and Leroi-Gourhan 1964)
>40	Definite	France	A. Castanet (Peyrony 1935)	(Zilhao and d'Errico 1999) (Peyrony 1935)
>40	Definite	France	Isturitz [Isturits] V1 26	(Zilhao and d'Errico 1999) (Lévêque and Miskovsky 1983)
>40	Definite	Germany	Wildscheuer III	OxA datelist 26 (1998) (Hahn 1970) (Hahn 1977)
>40	Definite	Germany	Lommersum II c-4	(Hahn 1989)
>40	Definite	Germany	Lommersum II c-1	(Hahn 1989)
>40	Definite	Germany	Das Geissenklosterle IIIa [sq.66]	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994) (Conard and Bolus 2003)
>40	Definite	Germany	Das Geissenklosterle II	(Hahn 1988) (Münzel *et al.* 1994)
>40	Definite	Germany	Das Geissenklosterle II a [sq.33]	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
>40	Definite	Germany	Das Geissenklosterle III	(Hahn 1988) (Münzel *et al.* 1994) (Conard and Bolus 2003)
>40	Definite	Germany	Das Geissenklosterle II b [sq.34]	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
>40	Definite	Germany	Hahnofersand	(Allsworth-Jones 1986)
>40	Definite	Hungary	Pesko cave lowest layer clay	GrN datelist 10: 63. (Allsworth-Jones 1986)
>40	Definite	Hungary	Istallosko cave 9 [base]	(Vértes 1955) (Delporte 1957)

Date	Aurignacian Probability	Country	Site Name	Reference
>40	Definite	Hungary	Istallosko cave 9	(Vértes 1955), (Delporte 1957)
>40	Definite	Hungary	Istallosko cave 9 [top]	GrN datelist 10: 63. (Vértes 1955) (Delporte 1957)
>40	Definite	Italy	Gr. di Paina 9	(Mussi 1992) (Bartolomei *et al.* 1983)
40-36.5	Definite	Italy	Abri Fumane A2 (outer)	(Bartolomei *et al.* 1992)
40-36.5	Definite	Italy	Abri Fumane A2 (inner)	(Bartolomei *et al.* 1992)
40-36.5	Definite	Italy	Riparo Mochi G	OxA datelist 18 (1994)
40-36.5	Definite	Italy	Gr. Paglicci 24B2-1	
40-36.5	Definite	Poland	Spadzista St. A [humic soil, stillfried B]	(Kozlowski 2000)
40-36.5	Definite	Russia	Kostienki I cultural layer 3	(Soffer 1989) (Hahn 1977)
40-36.5	Definite	Spain	La Vina XIII [lower]	OxA datelist 24: 457.
40-36.5	Definite	Spain	L'Arbreda B1*[Level H?]	(Canal i Roquet and Carbonell i Roura 1989b) (Bischoff *et al.* 1989), (Soler i Masferrer and Maroto i Genover 1987), (Maroto *et al.* 1996)
40-36.5	Definite	Spain	Arenillas II	
40-36.5	Definite	Spain	Abric Romani 2	(Canal i Roquet and Carbonell i Roura 1989a) (Bischoff *et al.* 1994), (Maroto *et al.* 1996)
40-36.5	Definite	Spain	La Guelga lower black level [cave interior]	
40-36.5	Definite	Spain	Reclau Viver T III	(Canal i Roquet and Carbonell i Roura 1989d)
40-36.5	Definite	Spain	Mollet Cave 0.6-0.8m	OxA datelist 18 (1994) (Canal i Roquet and Carbonell i Roura 1989c) (Maroto *et al.* 1996)
40-36.5	Definite	Spain	Castillo 18B2 [upper]	(Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Definite	Spain	Castillo 18B1 [upper]	(Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
40-36.5	Definite	Spain	Castillo 18B2 [base]	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
40-36.5	Definite	Spain	Castillo 18C	(Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
40-36.5	Definite	Spain	Castillo 18B2	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
40-36.5	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
40-36.5	Definite	U.K.	Kent's Cavern cave earth A2	(Campbell 1977) (Aldhouse-Green and Pettitt 1998)
40-36.5	Probable	Belgium	Trou Magrite 2 base	(Otte and Straus 1995)
40-36.5	Probable	Belgium	Trou Magrite 3 mid	(Otte and Straus 1995)
40-36.5	Probable	Russia	Kostienki XVII [Spitsyn site] 2	(Anikovich 1992) (Soffer 1989)
40-36.5	Probable	Slovenia	Divje Babe 2	(Karavanic 2000)
40-36.5	Probable	Spain	Cova Beneito upper [VIII]	(Iturbe and Cortell 1987) (Villaverde *et al.* 1998)
40-36.5	Probable	Spain	Cueva de el Pendo VIII	(Bernaldo de Quiros Pers. Comm.) (Gonzalez Echegaray 1980)
40-36.5	Probable	Spain	Cueva de el Pendo VIIIa/b	(Bernaldo de Quiros pers. Comm.) (Gonzalez Echegaray 1980)
40-36.5	Probable	Turkey	Ucagizli Magara H	(Kuhn *et al.* 1999) (Kuhn *et al.* 2001) (Minzoni-Déroche 1992)
40-36.5	Probable	U.K.	Bench Quarry "Tunnel" cavern	OxA datelist 9 (1989) (Aldhouse-Green and Pettitt 1998)
40-36.5	Probable	U.K.	King Arthur's Cave mammoth layer	(Taylor 1928) OxA datelist 9 (1989)
40-36.5	Probable	U.K.	Pin Hole Cave	OxA datelist 9 (1989) (Jacobi *et al.* 1998)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Probable	U.K.	Robin Hood's Cave	OxA datelist 22 (1996)
40-36.5	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 9 (1989) (Jacobi *et al.* 1998)
40-36.5	Probable	U.K.	Kent's Cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
40-36.5	Probable	U.K.	Paviland Cave [Goat's Hole]	OxA datelist 3 (1986) (Swainston 2000) (Turner 2000a)
40-36.5	Unlikely	Austria	Salzofenhohle	GrN datelist 3.
40-36.5	Unlikely	Austria	Salzofenhohle phosphate-earth	(Allsworth-Jones 1986) GrN datelist 7: 118 (1967]
40-36.5	Unlikely	France	Perte de Bramarie [Caniac du Causse]	Radiocarbon 21: 417 (Lyon datelist 8)
40-36.5	Unlikely	Italy	Gr. dei Moscerini	(Kuhn 1995)
40-36.5	Unlikely	Italy	Gr. Guattari	(Kuhn 1995)
40-36.5	Unlikely	U.K.	Hyaena Den	OxA datelist 22 (1996)
40-36.5	Unlikely	U.K.	Pin Hole Cave 68	(Jacobi *et al.* 1998)
40-36.5	Unlikely	U.K.	Pin Hole Cave 69	(Jacobi *et al.* 1998)
40-36.5	Unlikely	U.K.	Hyaena Den	[OxA datelist 22 (1996) (Tratman *et al.* 1971)
40-36.5	Unlikely	U.K.	Pin Hole Cave 50	(Jacobi *et al.* 1998)
40-36.5	Unlikely	U.K.	Pin Hole Cave 48	(Jacobi *et al.* 1998)
40-36.5	Unlikely	U.K.	Pin Hole Cave 37	(Jacobi *et al.* 1998)
40-36.5	Unlikely	U.K.	Soldier's Hole spit 16	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
40-36.5	Unlikely	U.K.	Soldier's Hole spit 20	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
40-36.5	Unlikely	U.K.	King Arthur's Cave red clay	(Taylor 1928) OxA datelist 9 (1989)
40-36.5	Unlikely	U.K.	Picken's Hole, Layer 3	Radiocarbon, 21: 340 (British Museum datelist 11) (Tratman 1964) (Stuart 1982)
40-36.5	Definite	Belgium	Gr. du Haleux	
40-36.5	Definite	Belgium	Trou Walou C6	(Draily 1998)
40-36.5	Definite	Bosnia	Luscic	
40-36.5	Definite	Croatia	Sandalja II f[-5-5.5m]	(Allsworth-Jones 1986)
40-36.5	Definite	Croatia	Velika Pecina 2 g	(Karavanic 1995)
40-36.5	Definite	Croatia	Sandalja [III] e [-4.5-5m]	(Allsworth-Jones 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
40-36.5	Definite	France	La Ferrassie [Els] G0	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	La Ferrassie [Els] G1	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	La Ferrassie F	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	La Ferrassie I2	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	Abri du Facteur 21G	(Delporte 1968) (Leroi-Gourhan 1968)
40-36.5	Definite	France	La Ferrassie K3b	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	La Salpetriere [Remoulins] 30 M	Radiocarbon 18: 81 (Lyon datelist 6). (Escalon de Fonton 1966) (Bazile 1984)
40-36.5	Definite	France	Le Flageolet I [Bezenac] VIII/1	Radiocarbon 27: 445 (Lyon datelist 10). (Rigaud 1976)
40-36.5	Definite	France	Le Flageolet I [Bezenac] VIII/2	Radiocarbon 27: 445 (Lyon datelist 10). (Rigaud 1976)
40-36.5	Definite	France	Le Flageolet I [Bezenac] IX	Radiocarbon 27: 445 (Lyon datelist 10). (Rigaud 1976)
40-36.5	Definite	France	Fontenioux [St Pierre de Maille]	Radiocarbon 27: 446 (Lyon datelist 10). (Perpère 1973)
40-36.5	Definite	France	Roc de Marcamps [Prignac-et-Marcamps] 8M30-N30	Radiocarbon 27: 442.
40-36.5	Definite	France	La Ferrassie Els	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
40-36.5	Definite	France	Abri Pataud 6	OxA datelist 5 (1987) (Movius 1975)
40-36.5	Definite	France	Canecaude I [Villardonel] 4	Radiocarbon 24(3): 323. (Sacchi 1976)
40-36.5	Definite	France	Canecaude I [Villardonel] 3	Radiocarbon 24(3): 323. (Sacchi 1976)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Definite	France	Gr de Hyenes, Brassempouy level 2E [square BA12]	(Buisson 1993) (Patou-Mathis and Boukhima 1993) (Bon 1993)
40-36.5	Definite	Germany	Das Geissenklosterle III	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994) (Conard and Bolus 2003)
40-36.5	Definite	Germany	Das Geissenklosterle II	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
40-36.5	Definite	Germany	Paderborn	(Allsworth-Jones 1986)
40-36.5	Definite	Italy	Gr Barbara	Paul Pettitt database (Mussi 1992)
40-36.5	Definite	Moldavia	Climautsy II [in Lower Climautsi village, near mouth of one of the dextral bank Dniestr tributaries]	(Cohen and Stepanchuk 1999)
40-36.5	Definite	Romania	Mitoc Malul Galben 8b [-7.95m] [sq. C5]	(Honea 1986), (Chirica 1986)
40-36.5	Definite	Romania	Ceahlau-Cetatica II	Paul Pettitt database. (Honea 1986) (Allsworth-Jones 1986)
40-36.5	Definite	Romania	Mitoc Malul Galben 9b [-7-9-8.0] [sq. H7]	(Honea 1986) (Chirica 1986)
40-36.5	Definite	Romania	Mitoc Malul Galben 10b [-9.35m] [sq. A7]	(Honea 1986) (Chirica 1986)
40-36.5	Definite	Romania	Ceahlau-Cetatica I	(Honea 1986) (Chirica 1986)
40-36.5	Definite	Russia	Jabrud I 6	GrN datelist 10: 49
40-36.5	Definite	Russia	Siuren I Ga	
40-36.5	Definite	Russia	Buran-Kaya III	OxA datelist 21 (1996)
40-36.5	Definite	Russia	Kostienki I cultural layer 3	(Soffer 1989) (Hahn 1977)
40-36.5	Definite	Russia	Kostienki VIII [Tel'manskaya site]	(Anikovich 1992) (Soffer 1989)
40-36.5	Definite	Spain	L'Arbreda -4.85-4.95m [Level G]	(Canal i Roquet and Carbonell i Roura 1989b) (Bischoff *et al.* 1989) (Soler i Masferrer and Maroto i Genover 1987) (Maroto *et al.* 1996)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Definite	Spain	L'Arbreda -5.05-5.4m [Level H?]	(Canal i Roquet and Carbonell i Roura 1989b) (Bischoff *et al.* 1989) (Soler i Masferrer and Maroto i Genover 1987) (Maroto *et al.* 1996)
40-36.5	Definite	Spain	Cueva Morin 7	(Gonzalez Echegaray and Freeman 1978) (Bernaldo de Quiros and Moure-Romanillo 1978)
40-36.5	Definite	Spain	Labeko Koba VII (base)	
40-36.5	Definite	Spain	Labeko Koba V	
40-36.5	Definite	Spain	Castillo 18C	(Cabrera-Valdés *et al.* 1996) (Cabrera Valdes and Bischoff 1989) (Cabrera Valdés 1984)
40-36.5	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
40-36.5	Probable	Austria	Albernedorf [in der Riedmark]	(Svoboda *et al.* 1996)
40-36.5	Probable	Austria	Horn (Raberstrasse)	(Svoboda *et al.* 1996)
40-36.5	Probable	Belgium	Trou du Renard	(Allsworth-Jones 1986) (Otte 1994)
40-36.5	Probable	Belgium	Trou Magrite 3	(Otte and Straus 1995)
40-36.5	Probable	Belgium	Trou Magrite 2	(Otte and Straus 1995)
40-36.5	Probable	Belgium	Trou Magrite 2 base	(Otte and Straus 1995)
40-36.5	Probable	France	Solutre [O/A] "sondage C"	Radiocarbon 5: 64 (?63)
40-36.5	Probable	France	Gr. du Castellas [Dourgne] Radiocarbon 25(1): 73 (Lyon datelist 9).	
40-36.5	Probable	Gibraltar	Gorham's Cave context 7 [?=D], combustion zone	(Barton *et al.* 1999) (Waechter 1951)
40-36.5	Probable	Portugal	Caldeirao Cave Jb	
40-36.5	Probable	Spain	Rascano Cave 7	Radiocarbon, 24: 251 (British Museum datelist 14)
40-36.5	Probable	Spain	Cova Beneito upper [VIII]	(Villaverde *et al.* 1998) (Iturbe and Cortell 1987)
40-36.5	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 7 (1988) (Jacobi *et al.* 1998)

Date	Aurignacian Probability	Country	Site Name	Reference
40-36.5	Probable	U.K.	Bench Quarry "Tunnel" cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
40-36.5	Probable	U.K.	Paviland Cave [Goat's Hole]	OxA datelist 3 (1986) (Turner 2000a) (Swainston 2000)
40-36.5	Probable	U.K.	Paviland Cave [Goat's Hole] occupation horizon	OxA datelist 3 (1986) (Turner 2000a) (Swainston 2000)
40-36.5	Probable	Ukraine	Sagaidak I	(Cohen and Stepanchuk 1999)
40-36.5	Probable	Ukraine	Korpach 4	(Anikovich 1992) (Cohen and Stepanchuk 1999)
40-36.5	Unlikely	Belgium	Goyet	(Toussaint *et al.* 1998) (Allsworth-Jones 1986)
40-36.5	Unlikely	Czech	Predmosti	(Svoboda *et al.* 1994) (Svoboda *et al.* 1996)
40-36.5	Unlikely	France	Gr des Fieux [Miers]	(Champagne *et al.* 1990)
40-36.5	Unlikely	France	Gr de la Mere Clochette	Radiocarbon 25(1): 118. (Desbrosse 1978) (Desbrosse 1985)
40-36.5	Unlikely	U.K.	Soldier's Hole spit 8	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
40-36.5	Unlikely	U.K.	Ogof-yr-Ichen, Caldey island	(Stuart 1982)
40-36.5	Unlikely	U.K.	Picken's Hole, Layer 3	(Tratman 1964) (Stuart 1982)
40-36.5	Unlikely	Ukraine	Anetovka II	Paul Pettitt database. (Cohen and Stepanchuk 1999)
40-36.5		France	Igue de Barriere[s]	Radiocarbon 27: 397 (Lyon datelist 10)
40-36.5		Romania	Climautsy II II	
40-36.5	Definite	Austria	Willendorf II 4/C4	GrN datelist 6: 97. (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
40-36.5	Definite	Belgium	Trou Walou C6C	(Draily 1998)
36.5-33	Definite	Belgium	Trou Walou C6	(Draily 1998)
36.5-33	Definite	Belgium	Gr. du Haleux [Sprimont]	
36.5-33	Definite	Belgium	Trou Al'Wesse ?	(Otte *et al.* 1998a)
36.5-33	Definite	Bosnia	Luscic	

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4A	(Kozlowski *et al.* 1982) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4C	(Kozlowski *et al.* 1982) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4B	(Kozlowski *et al.* 1982) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Bacho Kiro 6a/7	Radiocarbon 20: 51 (Lyon datelist 7) (Kozlowski 1982)
36.5-33	Definite	Croatia	Sandalja II g	
36.5-33	Definite	Croatia	Velika Pecina 2 g	(Karavanic 1995)
36.5-33	Definite	Croatia	Sandalja II f[-5-5.5m]	(Allsworth-Jones 1986)
36.5-33	Definite	Czech	Stranska-skala IIIb 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
36.5-33	Definite	Czech	Pod Hradem Cave A 8	(Valoch 1996a) (Allsworth-Jones 1986)
36.5-33	Definite	France	Canecaude I [Villardonel] 4	(Sacchi 1976) Radiocarbon 24(3): 323.
36.5-33	Definite	France	La Ferrassie I2	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	Gr de Hyenes, Brassempouy 2b [square BD4/5/6]	(Buisson 1993) (Patou-Mathis and Boukhima 1993) (Bon 1993)
36.5-33	Definite	France	Le Flageolet I [Bezenac] VIII/2	(Rigaud 1976)
36.5-33	Definite	France	Abri Pataud 6	OxA datelist 5 (1987) (Movius 1975)
36.5-33	Definite	France	Le Flageolet I [Bezenac] VIII/1	(Mellars *et al.* 1987) (Rigaud 1976)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
36.5-33	Definite	France	Roc de Marcamps [Prignac-et-Marcamps] 8M30-N30	Radiocarbon 27: 442.
36.5-33	Definite	France	Le Flageolet I [Bezenac] IX	Radiocarbon 27: 445 (Lyon datelist 10) (Rigaud 1976)
36.5-33	Definite	France	Brassempouy [Grande Galerie 2] 2f sup. [square Q5]	(Buisson 1993)
36.5-33	Definite	France	La Salpetriere [Remoulins] 30 M	Radiocarbon 18: 81 (Lyon datelist 6). (Escalon de Fonton 1966) (Bazile 1984)
36.5-33	Definite	France	Esquicho-Grapaou SLC1A	(Bazile 1976) (Bazile 1984)
36.5-33	Definite	France	La Ferrassie I1	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	La Ferrassie K3d	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	La Ferrassie [Els] G0	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	Gr de Hyenes, Brassempouy level 2DD [square BD4]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)
36.5-33	Definite	France	La Ferrassie G1 sagg[ital]	(Mellars *et al.* 1987) (Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	La Ferrassie K4	(Mellars *et al.* 1987) (Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	Esquicho-Grapaou BR1*	(Bazile 1976) (Bazile 1984)
36.5-33	Definite	France	Fontenioux [St Pierre de Maille]	Radiocarbon 27: 446 (Lyon datelist 10). (Perpère 1973)
36.5-33	Definite	France	La Ferrassie K3b	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	France	Gr de Hyenes, Brassempouy level 2E [square BA11]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)
36.5-33	Definite	France	La Ferrassie Els	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	Abri Caminade [Caneda] lower layer	(de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
36.5-33	Definite	France	Abri du Facteur 21G	(Delporte 1968) (Leroi-Gourhan 1968)
36.5-33	Definite	France	La Rochette [St Leon sur Vezere] 4	GrN datelist 7: 113. (Delporte 1963)
36.5-33	Definite	France	La Rochette [St Leon sur Vezere] 5c	GrN datelist 7: 113. (Delporte 1963)
36.5-33	Definite	France	Grotte du Renne, Arcy-sur-Cure VII	(Bailloud 1953) (Lévêque and Miskovsky 1983) (Leroi-Gourhan 1976) (Leroi-Gourhan and Leroi-Gourhan 1964)
36.5-33	Definite	Germany	Vogelherd Cave IV/V	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
36.5-33	Definite	Germany	Lommersum II c-4	(Hahn 1989)
36.5-33	Definite	Germany	Vogelherd Cave IV	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
36.5-33	Definite	Germany	Das Geissenklosterle II a	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
36.5-33	Definite	Germany	Lommersum II c-6	(Hahn 1989)
36.5-33	Definite	Germany	Lommersum II c-7	(Hahn 1989)
36.5-33	Definite	Germany	Lommersum II c-8	(Hahn 1989)
36.5-33	Definite	Germany	Das Geissenklosterle II	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
36.5-33	Definite	Germany	Wildscheuer III	OxA datelist 26 (1998) (Hahn 1970) (Hahn 1977)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Germany	Das Geissenklosterle III	(Hahn 1988) (Hahn 1989) (Conard and Bolus 2003)
36.5-33	Definite	Germany	Hahnofersand	(Allsworth-Jones 1986)
36.5-33	Definite	Germany	Hohlenstein-Stadel [IV]	(Hahn 1971) (Hahn 1977)
36.5-33	Definite	Germany	Vogelherd Cave V	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
36.5-33	Definite	Germany	Paderborn	(Allsworth-Jones 1986)
36.5-33	Definite	Germany	Kelsterbach	Radiocarbon 26: 190 (Frankfurt datelist 1) (Protsch and Semmel 1978), (Allsworth-Jones 1986)
36.5-33	Definite	Italy	Gr. Paglicci 24A1	
36.5-33	Definite	Italy	Abri Fumane D3b	(Bartolomei *et al.* 1992)
36.5-33	Definite	Italy	Gr. La Cala [front part: "atrio"]	Radiocarbon 19: 166 (Florence datelist 3).(Mussi 1992)
36.5-33	Definite	Italy	Gr Barbara	Paul Pettitt database.(Mussi 1992)
36.5-33	Definite	Poland	Spadzista St. A [humic soil, stillfried B]	(Kozlowski 2000)
36.5-33	Definite	Romania	Ceahlau-Cetatica II	Paul Pettitt database. (Honea 1986) (Allsworth-Jones 1986)
36.5-33	Definite	Romania	Mitoc Malul Galben 10b [-9.35m] [sq. A7]	(Honea 1986) (Chirica 1986)
36.5-33	Definite	Romania	Mitoc Malul Galben 11sup. [10.9m] [sq. J4]	(Honea 1986) (Chirica 1986)
36.5-33	Definite	Romania	Ceahlau-Cetatica I	Paul Pettitt database. (Honea 1986) (Chirica 1986)
36.5-33	Definite	Romania	Ripiceni-Izvor Ib [upper]	(Honea 1986) (Hahn 1977) (Allsworth-Jones 1986) (Chirica 1986)
36.5-33	Definite	Romania	Mitoc Malul Galben 8b [-8.0m] [sq. B4]	(Honea 1986) (Chirica 1986)
36.5-33	Definite	Romania	Mitoc Malul Galben 9b [-9.1m] [sq. H3]	(Honea 1986) (Chirica 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Russia	Kostienki I cultual layer 3	(Soffer 1989) (Hahn 1977)
36.5-33	Definite	Russia	Jabrud I 6	
36.5-33	Definite	Russia	Kostienki VIII [Tel'manskaya site]	(Anikovich 1992) (Soffer 1989)
36.5-33	Definite	Spain	L'Arbreda -5.05-5.4m [Level H?]	(Canal i Roquet and Carbonell i Roura 1989b) (Bischoff *et al.* 1989) (Soler i Masferrer and Maroto i Genover 1987) (Maroto *et al.* 1996)
36.5-33	Definite	Spain	La Guelga lower black level [cave interior]	
36.5-33	Definite	Spain	Cueva Morin 7	(Gonzalez Echegaray and Freeman 1978) (Bernaldo de Quiros and Moure-Romanillo 1978)
36.5-33	Definite	Spain	Mallaetes Cave XII	(Bernaldo de Quiros and Moure-Romanillo 1978)
36.5-33	Definite	Spain	Reclau Viver T III	(Canal i Roquet and Carbonell i Roura 1989d)
36.5-33	Definite	Spain	Ruso [I] 5a	
36.5-33	Definite	Spain	Abric Romani 2	(Canal i Roquet and Carbonell i Roura 1989a) (Bischoff *et al.* 1994) (Maroto *et al.* 1996)
36.5-33	Definite	Spain	Cueva Morin 7/6	(Gonzalez Echegaray and Freeman 1978) (Bernaldo de Quiros and Moure-Romanillo 1978)
36.5-33	Definite	Spain	Labeko Koba VII (base)	
36.5-33	Definite	Spain	Labeko Koba V	
36.5-33	Definite	Spain	Labeko Koba VII (top)	
36.5-33	Definite	Spain	Castillo 18C	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
36.5-33	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
36.5-33	Definite	U.K.	Kent's Cavern cave earth A2	(Campbell 1977) (Aldhouse-Green and Pettitt 1998)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Ukraine	Siuren I Fb1	(Anikovich 1992) (Demidenko *et al.* 1998) (López Bayón 1998)
36.5-33	Probable	Austria	Alberndorf [in der Riedmark]	(Svoboda *et al.* 1996)
36.5-33	Probable	Austria	Krems-Galgenberg	(Bednarik 1989)
36.5-33	Probable	Belgium	Trou du Renard	(Allsworth-Jones 1986) (Otte 1994)
36.5-33	Probable	Belgium	Trou Magrite 3	(Otte and Straus 1995)
36.5-33	Probable	Belgium	Trou Magrite 2	(Otte and Straus 1995)
36.5-33	Probable	Belgium	Trou Magrite 2 base	(Otte and Straus 1995)
36.5-33	Probable	France	Gr. de Latrone [Ste. Anastasie]	Radiocarbon 25(1): 74 (Lyon datelist 9) (Louis and Drouot 1953) (Drouot 1953)
36.5-33	Probable	France	Solutre [O/A] "sondage C"	Radiocarbon 5: 64 (?63)
36.5-33	Probable	France	Gr. du Castellas [Dourgne] Radiocarbon 25(1): 73 (Lyon datelist 9).	
36.5-33	Probable	Gibraltar	Gorham's Cave D	GrN datelist 5: 350 (Barton *et al.* 1999) (Waechter 1951)
36.5-33	Probable	Gibraltar	Gorham's Cave context 7 [?=D], combustion zone	(Barton *et al.* 1999) (Waechter 1951)
36.5-33	Probable	Gibraltar	Gorham's Cave context 9 [?=D], combustion zone	(Barton *et al.* 1999) (Waechter 1951)
36.5-33	Probable	Gibraltar	Gorham's Cave context 15, combustion zone	(Barton *et al.* 1999) (Waechter 1951)
36.5-33	Probable	Gibraltar	Gorham's Cave context 13a, combustion zone	(Barton *et al.* 1999) (Waechter 1951)
36.5-33	Probable	Portugal	Caldeirao Cave Jb	Zilhao, J. (1998) paper given at the "Gibraltar and the Neanderthals" conference, Gibraltar 1998.
36.5-33	Probable	Russia	Kostienki XVII [Spitsyn site] 2	Radiocarbon, 10: 431 (Geological Institute datelist 2). (Soffer 1989) (Anikovich 1992)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Probable	Spain	Rascano Cave 7	Radiocarbon, 24: 251 British Museum datelist 14)
36.5-33	Probable	Spain	Rascano Cave 7	Radiocarbon, 24: 251 (British Museum datelist 14)
36.5-33	Probable	Spain	Cova Beneito upper [VIII]	(Villaverde *et al.* 1998) (Iturbe and Cortell 1987)
36.5-33	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 9 (1989) (Jacobi *et al.* 1998)
36.5-33	Probable	U.K.	Bench Quarry "Tunnel" cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
36.5-33	Probable	U.K.	Cave 8, Uphill Quarry	(Jacobi and Pettitt 2000)
36.5-33	Probable	U.K.	Robin Hood's Cave	OxA datelist 22 (1996)
36.5-33	Probable	U.K.	Kent's Cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
36.5-33	Probable	U.K.	Paviland Cave [Goat's Hole]	(Aldhouse-Green and Pettitt 1998) (Swainston 2000) (Turner 2000a)
36.5-33	Probable	U.K.	Paviland Cave [Goat's Hole] occupation horizon	OxA datelist 3 (1986) (Turner 2000a) (Swainston 2000)
36.5-33	Probable	Ukraine	Sagaidak I	Paul Pettitt database. (Cohen and Stepanchuk 1999)
36.5-33	Probable	Ukraine	Korpach 4	(Anikovich 1992), (Cohen and Stepanchuk 1999)
36.5-33	Probable	Ukraine	Siuren I Ga	(Anikovich 1992) (Chabai 1998) (Demidenko *et al.* 1998) (López Bayón 1998)
36.5-33	Unlikely	Austria	Salzofenhohle	GrN datelist 7 (1967): 117.
36.5-33	Unlikely	Czech	Predmosti	Paul Pettitt database. (Svoboda *et al.* 1994) (Svoboda *et al.* 1996)
36.5-33	Unlikely	France	Gr de la Mere Clochette	Radiocarbon 25(1): 118. (Desbrosse 1978) (Desbrosse 1985)
36.5-33	Unlikely	France	Les Rivaux, Loc. 1 [Espaly-St-Marcel]	Radiocarbon 25(1): 77-8 (Lyon datelist 9).
36.5-33	Unlikely	France	Gr des Fieux [Miers]	(Champagne *et al.* 1990)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Unlikely	France	Perte de Bramarie [Caniac du Causse]	Radiocarbon 21: 417 (Lyon datelist 8)
36.5-33	Unlikely	Romania	Mitoc Malul Galben 7b [-7.05m] [sq. D4]	(Honea 1986) (Chirica 1986)
36.5-33	Unlikely	Russia	Kostienki XII [Volkovskaya] 1a	(Soffer 1989) (Anikovich 1992)
36.5-33	Unlikely	U.K.	Soldier's Hole spit 8	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
36.5-33	Unlikely	U.K.	Soldier's Hole spit 13	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
36.5-33	Unlikely	U.K.	Soldier's Hole spit 9	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
36.5-33	Unlikely	U.K.	Hoyle's Mouth	OxA datelist 6 (1987) (Aldhouse-Green and Pettitt 1998)
36.5-33	Unlikely	U.K.	Picken's Hole, Layer 3	Radiocarbon, 21: 340 [British Museum datelist 11) (Stuart 1982) (Tratman 1964)
36.5-33	Unlikely	Ukraine	Buran-Kaya III layer 6-10	OxA datelist 21 (1996) (Marks 1998) (Monigal 2001) (Marks and Monigal 2000) (d'Errico and Laroulandie 2000)
36.5-33	Unlikely	Ukraine	Anetovka II	Paul Pettitt database. (Cohen and Stepanchuk 1999)
36.5-33		France	Igue de Barriere[s]	Radiocarbon 27: 397 (Lyon datelist 10)
36.5-33	Definite	Austria	Willendorf II 2?/D1 mid.	[GrN datelist 6: 97. (Otte 1994) (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
36.5-33	Definite	Austria	Willendorf II 2?/D1 up.	(Haesaerts *et al.* 1996) (Otte 1994) (Hahn 1977) (Broglio and Laplace 1966)
36.5-33	Definite	Austria	Willendorf II 3/C8	GrN datelist 6: 97. (Otte 1994) (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Austria	Willendorf II 4/C4	(Haesaerts *et al.* 1996) (Otte 1994) (Hahn 1977) (Broglio and Laplace 1966)
36.5-33	Definite	Austria	Krems-Hundssteig brown layer	(Hahn 1977) (Broglio and Laplace 1966) (Strobl and Obermaier 1909) (Allsworth-Jones 1986) (Hahn 1970)
36.5-33	Definite	Belgium	Trou Walou C6C	(Draily 1998)
36.5-33	Definite	Belgium	Trou Al'Wesse ?	(Otte *et al.* 1998a)
36.5-33	Definite	Bulgaria	Bacho Kiro 11	OxA datelist 18 (1994) (Kozlowski 1982)
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4B	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Temnata Cave TD-V/4A	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992)
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4C	(Kozlowski *et al.* 1992) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Temnata Cave TD-1/4A	(Kozlowski *et al.* 1992) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
36.5-33	Definite	Bulgaria	Bacho Kiro 7	OxA datelist 18 (1994) (Kozlowski 1982)
36.5-33	Definite	Bulgaria	Bacho Kiro 6b	OxA datelist 18 (1994) (Kozlowski 1982)
36.5-33	Definite	Bulgaria	Bacho Kiro 6a/7	Radiocarbon 20: 51 (Lyon datelist 7) (Kozlowski 1982)
36.5-33	Definite	Croatia	Sandalja II g	
36.5-33	Definite	Croatia	Velika Pecina 2 I	GrN datelist 10: 60. (Karavanic 1995) (Karavanic 2000)
36.5-33	Definite	Croatia	Velika Pecina 2 g	(Karavanic 1995)

Date	Aurignacian Probability	Country	Site Name	Reference
36.5-33	Definite	Czech	Stranska-skala II a 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
36.5-33	Definite	Czech	Stranska-skala IIIb 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
36.5-33	Definite	Czech	Stranska-skala IIIa 3	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
36.5-33	Definite	Czech	Pod Hradem Cave A 8	GrN datelist 6: 102.(Valoch 1996a) (Allsworth-Jones 1986)
36.5-33	Definite	France	La Ferrassie K3d	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
36.5-33	Definite	France	Roc de Combe [Nadaillac] 7b	OxA datelist 10 (1990) (Bordes and Labrot 1967) (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
36.5-33	Definite	France	Roc de Combe [Nadaillac] 7c	OxA datelist 10 (1990) (Bordes and Labrot 1967), (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
33-29.5	Definite	France	Abri Pataud 14	GrN datelist 7: 115 (Movius 1975) (Rigaud 1991)
33-29.5	Definite	France	Le Flageolet I [Bezenac] XI	(Mellars *et al.* 1987) (Rigaud 1976)
33-29.5	Definite	France	Gr de Hyenes, Brassempouy level 2DD [square BD4]	(Buisson 1993) (Buisson 1993; Bon 1993) (Patou-Mathis and Boukhima 1993)
33-29.5	Definite	France	Le Flageolet I [Bezenac] VIII/2	Radiocarbon 27: 445 (Lyon datelist 10) (Rigaud 1976)
33-29.5	Definite	France	La Ferrassie K4	Radiocarbon 28: 17 (Djindjian 1986) (Delporte 1984) (Peyrony 1934)
33-29.5	Definite	France	Esquicho-Grapaou SLC 1B	(Bazile 1976) (Bazile 1984)
33-29.5	Definite	France	Esquicho-Grapaou SLC1A	(Bazile 1976) (Bazile 1984)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
33-29.5	Definite	France	La Ferrassie I1	Radiocarbon 28: 17 (Djindjian 1986) (Delporte 1984) (Peyrony 1934)
33-29.5	Definite	France	Abri Pataud 8	Paul Pettitt database. (Movius 1975) (Rigaud 1991)
33-29.5	Definite	France	La Salpetriere [Remoulins] 30 M	Radiocarbon 18: 81 (Lyon datelist 6). (Escalon de Fonton 1966) (Bazile 1984)
33-29.5	Definite	France	Abri Pataud 12	GrN datelist 7: 115 (Movius 1975)
33-29.5	Definite	France	A. Combe Sauniere [Sarliac-sur-l'Isle]	(Mellars 1999)
33-29.5	Definite	France	Abri Pataud 11	GrN datelist 7: 115 (Movius 1975)
33-29.5	Definite	France	Abri Pataud ??	(Movius 1975)
33-29.5	Definite	France	La Ferrassie G1 sagg[ital]	(Mellars *et al.* 1987) (Djindjian 1986) (Delporte 1984) (Peyrony 1934)
33-29.5	Definite	France	Abri Caminade [Caneda] D21	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
33-29.5	Definite	France	Brassempouy [Grande Galerie 2] 2f sup. [square Q5]	(Buisson 1993)
33-29.5	Definite	France	Abri Pataud 7	GrN datelist 7: 114 (Movius 1975)
33-29.5	Definite	France	Esquicho-Grapaou BR1*	(Bazile 1976) (Bazile 1984)
33-29.5	Definite	France	Gr de Hyenes, Brassempouy 2a [square BC6/5-BD6]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)
33-29.5	Definite	France	Gr de Hyenes, Brassempouy 2b [square BD4/5/6]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	France	Abri du Facteur 21G	(Delporte 1957) (Delporte 1968) (Leroi-Gourhan 1968)
33-29.5	Definite	France	Abri Caminade [Caneda] lower layer	GrN datelist 4: 166 (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
33-29.5	Definite	France	La Ferrassie K6	(Djindjian 1986) (Delporte 1984)
33-29.5	Definite	France	La Rochette [St Leon sur Vezere] 4	GrN datelist 7: 113 (Delporte 1963)
33-29.5	Definite	France	Les Cottes [St. Pierre de Maille] E1	Radiocarbon 9: GrN datelist 7: 111 (Patte 1954) (Pradel 1961) (Lévêque and Miskovsky 1983) (Perpère 1973) (Bastin *et al.* 1976) (Bouchud 1961)
33-29.5	Definite	France	La Rochette [St Leon sur Vezere] 5c	GrN datelist 7: 113 (Delporte 1963)
33-29.5	Definite	France	La Quina Y-Z [Villebois la Valette] 1	(Patte 1956) (Lévêque and Miskovsky 1983) (Patte 1956)
33-29.5	Definite	France	Les Cottes [St. Pierre de Maille] E2	Radiocarbon 9: GrN datelist 7: 111. (Patte 1954) (Lévêque and Miskovsky 1983) (Perpère 1973) (Bastin *et al.* 1976) (Pradel 1961) (Bouchud 1961)
33-29.5	Definite	France	Les Cottes [St. Pierre de Maille] E3	Radiocarbon 9: GrN datelist 7: 111 (Patte 1954) (Pradel 1959) (Lévêque and Miskovsky 1983) (Perpère 1973) (Bastin *et al.* 1976) (Pradel 1961) (Bouchud 1961)
33-29.5	Definite	France	Grotte du Renne, Arcy-sur-Cure VII	GrN datelist 4: 166 (Lévêque and Miskovsky 1983) (Leroi-Gourhan 1976) (Leroi-Gourhan and Leroi-Gourhan 1964) (Bailloud 1953)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	Germany	Das Geissenklosterle II b	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
33-29.5	Definite	Germany	Lommersum II c-3	(Allsworth-Jones 1986) (Hahn 1989)
33-29.5	Definite	Germany	Das Geissenklosterle II a [sq.58]	(Zilhão and d'Errico 1999) (Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
33-29.5	Definite	Germany	Vogelherd Cave IV	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
33-29.5	Definite	Germany	Vogelherd Cave IV/V	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
33-29.5	Definite	Germany	Bockstein-Torle VII	(Hahn 1977) (Hahn 1970)
33-29.5	Definite	Germany	Das Geissenklosterle III	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994) (Conard and Bolus 2003)
33-29.5	Definite	Germany	Lommersum II c-2	(Hahn 1989)
33-29.5	Definite	Germany	Das Geissenklosterle III a	(Zilhão and d'Errico 1999) (Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994) (Conard and Bolus 2003)
33-29.5	Definite	Germany	Das Geissenklosterle II	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
33-29.5	Definite	Germany	Lommersum II c-5	(Hahn 1989)
33-29.5	Definite	Germany	Lommersum II c-8	(Hahn 1989)
33-29.5	Definite	Germany	Lommersum II c-7	(Hahn 1989)
33-29.5	Definite	Germany	Lommersum II c-4	(Hahn 1989)
33-29.5	Definite	Germany	Lommersum II c-6	(Hahn 1989)
33-29.5	Definite	Germany	Wildscheuer III	OxA datelist 26 (1998) (Hahn 1970) (Hahn 1977)
33-29.5	Definite	Germany	Lommersum II c-1	(Hahn 1989)
33-29.5	Definite	Germany	Hohlenstein-Stadel IV	(Hahn 1977) (Hahn 1971)
33-29.5	Definite	Germany	Vogelherd Cave V	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	Germany	Kelsterbach	Radiocarbon 26: 190 (Frankfurt datelist 1) Radiocarbon, 31: 64 (UCLA datelist 11) (Protsch and Semmel 1978), (Allsworth-Jones 1986)
33-29.5	Definite	Germany	Hahnofersand	(Allsworth-Jones 1986)
33-29.5	Definite	Hungary	Istallosko cave 9	(Vértes 1955) (Delporte 1957)
33-29.5	Definite	Hungary	Istallosko cave 8?	GrN datelist 4: 165 (Vértes 1955) (Delporte 1957) (Allsworth-Jones 1986) (Delporte 1957)
33-29.5	Definite	Italy	Abri Fumane D6	(Bartolomei *et al.* 1992)
33-29.5	Definite	Italy	Abri Fumane A1	(Bartolomei *et al.* 1992)
33-29.5	Definite	Italy	Gr. Paglicci 24B2-1	
33-29.5	Definite	Italy	Castelcivita gic	(Gambassini 1997)
33-29.5	Definite	Italy	Castelcivita tg.29-30	
33-29.5	Definite	Italy	Castelcivita rsa (upper)	(Gambassini 1997)
33-29.5	Definite	Italy	Abri Fumane A2 (outer)	(Bartolomei *et al.* 1992)
33-29.5	Definite	Italy	Gr. Paglicci 24A1	
33-29.5	Definite	Italy	Riparo Mochi G	OxA datelist 18 (1994): 347.
33-29.5	Definite	Italy	Abri Fumane D3b	(Bartolomei *et al.* 1992)
33-29.5	Definite	Italy	Serino (hearth)	Radiocarbon 21: 355 (Florence datelist 4) (Mussi 1992)
33-29.5	Definite	Italy	Gr. La Cala [front part: "atrio"]	Radiocarbon 19: 166 (Florence datelist 3) (Mussi 1992)
33-29.5	Definite	Italy	Abri Fumane A2 (inner)	(Bartolomei *et al.* 1992)
33-29.5	Definite	Poland	Spadzista St. A [humic soil, stillfried B]	(Kozlowski 2000)
33-29.5	Definite	Romania	Mitoc Malul Galben 11 inf. [-11.9-12.1m] [sq.J3]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Ripiceni-Izvor Ib [upper]	(Honea 1986) (Hahn 1977) (Allsworth-Jones 1986) (Chirica 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	Romania	Mitoc Malul Galben 10b [ca.-9.85m] [sqs. J02, G5, L5-6]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Mitoc Malul Galben 12b [-12.26-12.38m] [sq. J01]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Mitoc Malul Galben 8b [-7.95m] [sq. C5]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Mitoc Malul Galben 12a [-12.1-12.2m] [sq. J 1-3-5]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Mitoc Malul Galben 11 sup. [-11.0m] [sq. L6-5]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Romania	Mitoc Malul Galben 9b [-9.3m] [sq. K6]	(Honea 1986) (Chirica 1986)
33-29.5	Definite	Russia	Kostienki I cultural layer 3	(Soffer 1989) (Hahn 1977)
33-29.5	Definite	Russia	Jabrud I 6	GrN datelist 10: 49
33-29.5	Definite	Spain	Mallaetes Cave XII	(Bernaldo de Quiros and Moure-Romanillo 1978)
33-29.5	Definite	Spain	La Guelga lower black level [cave interior]	
33-29.5	Definite	Spain	Mollet Cave 0.6-0.8m	OxA datelist 18 (1994) (Canal i Roquet and Carbonell i Roura 1989c) (Maroto *et al.* 1996)
33-29.5	Definite	Spain	Labeko Koba V	
33-29.5	Definite	Spain	Labeko Koba VII (top)	
33-29.5	Definite	Spain	Cueva Morin 7	(Gonzalez Echegaray and Freeman 1978) (Bernaldo de Quiros and Moure-Romanillo 1978)
33-29.5	Definite	Spain	Abric Romani 2	(Canal i Roquet and Carbonell i Roura 1989a) (Bischoff *et al.* 1994) (Maroto *et al.* 1996)
33-29.5	Definite	Spain	Reclau Viver T III	(Canal i Roquet and Carbonell i Roura 1989d)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Definite	Spain	Cueva Morin 7/6	(Bernaldo de Quiros and Moure-Romanillo 1978) (Gonzalez Echegaray and Freeman 1978)
33-29.5	Definite	Spain	Ruso [I] 5a	Bernaldo de Quiros, pers. comm
33-29.5	Definite	Spain	Arenillas II	Bernaldo de Quiros, pers. comm
33-29.5	Definite	Spain	Castillo 16	(Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
33-29.5	Definite	Spain	Castillo 18C	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
33-29.5	Definite	Turkey	Ucagizli Magara C	(Minzoni-Déroche 1992) (Kuhn *et al.* 1999) (Kuhn *et al.* 2001)
33-29.5	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
33-29.5	Definite	U.K.	Kent's Cavern cave earth A2	(Campbell 1977) (Aldhouse-Green and Pettitt 1998)
33-29.5	Definite	Ukraine	Siuren I Fb1	(Anikovich 1992) (Demidenko *et al.* 1998) (López Bayón 1998)
33-29.5	Probable	Austria	Krems-Galgenberg	(Bednarik 1989)
33-29.5	Probable	Belgium	Trou Magrite 3	(Otte and Straus 1995)
33-29.5	Probable	Belgium	Trou Magrite 2	(Otte and Straus 1995)
33-29.5	Probable	Belgium	Trou Magrite 2 base	(Otte and Straus 1995)
33-29.5	Probable	France	Gr. de Latrone [Ste. Anastasie]	Radiocarbon 25(1): 74 (Lyon datelist 9). (Louis and Drouot 1953) (Drouot 1953)
33-29.5	Probable	Gibraltar	Gorham's Cave context 15, combustion zone	(Barton *et al.* 1999) (Waechter 1951)
33-29.5	Probable	Gibraltar	Gorham's Cave context 13a, combustion zone	(Barton *et al.* 1999) (Waechter 1951)
33-29.5	Probable	Gibraltar	Gorham's Cave context 9 [?=D], combustion zone	(Barton *et al.* 1999) (Waechter 1951)
33-29.5	Probable	Gibraltar	Gorham's Cave D	GrN datelist 5: 350. (Barton *et al.* 1999) (Waechter 1951)

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Probable	Russia	Kostienki XVII [Spitsyn site] 2	(Allsworth-Jones 1986) (Soffer 1989) (Anikovich 1992)
33-29.5	Probable	Spain	Rascano Cave 7	Radiocarbon, 24: 251 (British Museum datelist 14)
33-29.5	Probable	Spain	Cova Beneito upper [VIII]	(Iturbe and Cortell 1987) (Villaverde *et al.* 1998)
33-29.5	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 7 (1988) (Jacobi *et al.* 1998)
33-29.5	Probable	U.K.	Bench Quarry "Tunnel" cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
33-29.5	Probable	U.K.	Robin Hood's Cave	OxA datelist 22 (1996)
33-29.5	Probable	U.K.	Pin Hole Cave	(Jacobi *et al.* 1998)
33-29.5	Probable	U.K.	King Arthur's Cave mammoth layer	(Taylor 1928) OxA datelist 9 (1989)
33-29.5	Probable	U.K.	Kent's Cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
33-29.5	Probable	U.K.	Paviland Cave [Goat's Hole] occupation horizon	OxA datelist 3 (1986) (Turner 2000a) (Swainston 2000)
33-29.5	Probable	U.K.	Paviland Cave [Goat's Hole]	(Aldhouse-Green and Pettitt 1998) (Swainston 2000) (Turner 2000a)
33-29.5	Probable	Ukraine	Siuren I Ga	(Anikovich 1992) (Chabai 1998) (Demidenko *et al.* 1998) (López Bayón 1998)
33-29.5	Probable	Ukraine	Sagaidak I	Paul Pettitt database. (Cohen and Stepanchuk 1999)
33-29.5	Unlikely	Austria	Salzofenhohle	GrN datelist 3.
33-29.5	Unlikely	Austria	Willendorf II 1?/D3?	(Allsworth-Jones 1986) GrN datelist 6: 97. (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
33-29.5	Unlikely	France	Perte de Bramarie [Caniac du Causse]	Radiocarbon 21: 417 (Lyon datelist 8)
33-29.5	Unlikely	France	Les Rivaux, Loc. 1 [Espaly-St-Marcel]	Radiocarbon 25(1): 77-8 (Lyon datelist 9).

Date	Aurignacian Probability	Country	Site Name	Reference
33-29.5	Unlikely	Romania	Mitoc Malul Galben 7b [-7.05m] [sq. D4]	(Honea 1986) (Chirica 1986)
33-29.5	Unlikely	Russia	Kostienki XII [Volkovskaya] 1a	(Anikovich 1992) (Soffer 1989)
33-29.5	Unlikely	U.K.	Soldier's Hole spit 16	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
33-29.5	Unlikely	U.K.	Pin Hole Cave 70	(Jacobi *et al.* 1998)
33-29.5	Unlikely	U.K.	Soldier's Hole spit 20	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
33-29.5	Unlikely	U.K.	Soldier's Hole spit 13	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
33-29.5	Unlikely	U.K.	Picken's Hole, Layer 3	(Broglio and Laplace 1966) (Stuart 1982) (Tratman 1964)
33-29.5	Unlikely	U.K.	Kent's Cavern pink cave earth	OxA datelist 6 (1987) (Aldhouse-Green and Pettitt 1998)
33-29.5	Unlikely	Ukraine	Buran-Kaya III layer 6-10	OxA datelist 21 (1996) (Marks 1998) (Monigal 2001) (Marks and Monigal 2000) (d'Errico and Laroulandie 2000)
33-29.5	Definite	Austria	Willendorf II 3/C8	(Haesaerts *et al.* 1996) (Otte 1994) (Hahn 1977) (Broglio and Laplace 1966)
33-29.5	Definite	Austria	Willendorf II 2?/D1 mid.	(Haesaerts *et al.* 1996) (Otte 1994) (Hahn 1977) (Broglio and Laplace 1966)
29.5-26	Definite	Austria	Willendorf II 4/C4	GrN datelist 6: 97. (Otte 1994) (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)
29.5-26	Definite	Austria	Willendorf II 2/D1 up.	GrN datelist 6: 97. (Otte 1994) (Haesaerts *et al.* 1996) (Hahn 1977) (Broglio and Laplace 1966)

Date	Aurignacian Probability	Country	Site Name	Reference
29.5-26	Definite	Austria	Krems-Hundssteig brown layer	(Hahn 1977) (Broglio and Laplace 1966) (Strobl and Obermaier 1909) (Allsworth-Jones 1986) (Hahn 1970)
29.5-26	Definite	Belgium	Trou Al'Wesse L6/Ch15/F480/-543-647cm	(Otte *et al.* 1998a)
29.5-26	Definite	Belgium	Trou Al'Wesse ?	(Otte *et al.* 1998a)
29.5-26	Definite	Bulgaria	Temnata Cave TD-1/4C	(Kozlowski *et al.* 1992) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
29.5-26	Definite	Bulgaria	Temnata Cave TD-1/4B	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
29.5-26	Definite	Bulgaria	Temnata Cave TD-V/4A	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992)
29.5-26	Definite	Bulgaria	Bacho Kiro 11	OxA datelist 18 (1994) (Kozlowski 1982)
29.5-26	Definite	Bulgaria	Temnata Cave TD-1/4A	(Kozlowski *et al.* 1992) (Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992) (Drobniewicz *et al.* 1992)
29.5-26	Definite	Bulgaria	Temnata Cave TD-V/4B	(Ginter *et al.* 1996) (Marambat 1992) (Guadelli and Delpech 1992)
29.5-26	Definite	Bulgaria	Bacho Kiro 6b	(Kozlowski 1982)
29.5-26	Definite	Bulgaria	Bacho Kiro 7	OxA datelist 18 (1994) (Kozlowski 1982)
29.5-26	Definite	Croatia	Velika Pecina 2 I	GrN datelist 10: 60. (Karavanic 1995) (Karavanic 2000)
29.5-26	Definite	Czech	Pod Hradem Cave A 8	GrN datelist 6: 102. (Valoch 1996a) (Allsworth-Jones 1986)
29.5-26	Definite	Czech	Stranska-skala II a 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)

Date	Aurignacian Probability	Country	Site Name	Reference
29.5-26	Definite	Czech	Stranska-skala IIIb 4	(Valoch 1996a) (Svoboda *et al.* 1996) (Allsworth-Jones 1986)
29.5-26	Definite	France	Roche a Pierrot [St.-Cesaire] 6 [Ejo sup.]	(Lévêque and Vandermeersch 1980) (Leroi-Gourhan 1984) (Lévêque *et al.* 1993) (Lévêque and Miskovsky 1983)
29.5-26	Definite	France	Gr de Hyenes, Brassempouy 2b [square BD4/5/6]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)
29.5-26	Definite	France	A. Combe Sauniere [Sarliac-sur-l'Isle]	(Mellars 1999)
29.5-26	Definite	France	Abri Caminade [Caneda] G	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
29.5-26	Definite	France	La Salpetriere [Remoulins] 30 M	Radiocarbon 18: 81 (Lyon datelist 6) (Escalon de Fonton 1966) (Bazile 1984)
29.5-26	Definite	France	Abri Pataud ??	(Movius 1975)
29.5-26	Definite	France	Abri Pataud 12	(Movius 1975)
29.5-26	Definite	France	Abri Pataud 8	(Movius 1975)
29.5-26	Definite	France	Abri Caminade [Caneda] D21	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
29.5-26	Definite	France	Roc de Combe [Nadaillac] 7b	OxA datelist 10 (1990) (Bordes and Labrot 1967) (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
29.5-26	Definite	France	Roc de Combe [Nadaillac] 7c	OxA datelist 10 (1990) (Bordes and Labrot 1967) (Demars 1990) (Pelegrin 1995) (Lévêque and Miskovsky 1983) (Delpech 1972)
29.5-26	Definite	France	Esquicho-Grapaou SLC 1B	(Bazile 1976) (Bazile 1984)

Date	Aurignacian Probability	Country	Site Name	Reference
29.5-26	Definite	France	Abri Pataud 14	(Movius 1975)
29.5-26	Definite	France	Gr de Hyenes, Brassempouy 2a [square BD4/5/6]	(Buisson 1993) (Bon 1993) (Patou-Mathis and Boukhima 1993)
29.5-26	Definite	France	Esquicho-Grapaou SLC1A	(Bazile 1976) (Bazile 1984)
29.5-26	Definite	France	Abri Pataud 11	(Movius 1975)
29.5-26	Definite	France	Le Flageolet I [Bezenac] XI	(Zilhao and d'Errico 1999)
29.5-26	Definite	France	Abri Caminade [Caneda] F	(Zilhao and d'Errico 1999) (de Sonneville-Bordes and Mortureux 1955) (de Sonneville-Bordes 1970) (Lévêque and Miskovsky 1983) (Paquereau 1970)
29.5-26	Definite	France	Abri Pataud 7	GrN datelist 7: 114 (Movius 1975)
29.5-26	Definite	France	La Ferrassie K6	(Djindjian 1986) (Delporte 1984) (Peyrony 1934)
29.5-26	Definite	France	Grotte du Renne, Arcy-sur-Cure VII	(Bailloud 1953) (Lévêque and Miskovsky 1983) (Leroi-Gourhan 1976) (Leroi-Gourhan and Leroi-Gourhan 1964)
29.5-26	Definite	France	Isturitz [Isturits] V1 26	(Zilhao and d'Errico 1999) (Lévêque and Miskovsky 1983)
29.5-26	Definite	France	A. Castanet [Sergeac]	(Zilhao and d'Errico 1999) (Peyrony 1935)
29.5-26	Definite	France	Isturitz [Isturits] U27, 4d	(Zilhao and d'Errico 1999) (Lévêque and Miskovsky 1983)
29.5-26	Definite	Germany	Das Geissenklosterle II a [sq.48]	(Zilhão and d'Errico 1999) (Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
29.5-26	Definite	Germany	Lommersum II c-2	(Hahn 1989)
29.5-26	Definite	Germany	Lommersum II c-4	(Hahn 1989)
29.5-26	Definite	Germany	Das Geissenklosterle II	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)
29.5-26	Definite	Germany	Lommersum II c-1	(Hahn 1989)
29.5-26	Definite	Germany	Das Geissenklosterle II b	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994)

Date	Aurignacian Probability	Country	Site Name	Reference
29.5-26	Definite	Germany	Bockstein-Torle VII	(Allsworth-Jones 1986) (Hahn 1977) (Hahn 1970) (Conard and Bolus 2003)
29.5-26	Definite	Germany	Wildscheuer III	OxA datelist 26 (1998) (Hahn 1970) (Hahn 1977)
29.5-26	Definite	Germany	Das Geissenklosterle IIIa	(Hahn 1988) (Hahn 1989) (Conard and Bolus 2003)
29.5-26	Definite	Germany	Lommersum II c-3	(Hahn 1989) (Allsworth-Jones 1986)
29.5-26	Definite	Germany	Das Geissenklosterle III	(Hahn 1988) (Hahn 1989) (Münzel *et al.* 1994) (Conard and Bolus 2003)
29.5-26	Definite	Germany	Lommersum II c-5	(Hahn 1989)
29.5-26	Definite	Germany	Hahnofersand	(Allsworth-Jones 1986)
29.5-26	Definite	Germany	Kelsterbach	(Protsch and Semmel 1978) (Allsworth-Jones 1986)
29.5-26	Definite	Germany	Vogelherd Cave V	(Riek 1933) (Allsworth-Jones 1986) (Hahn 1977) (Conard and Bolus 2003)
29.5-26	Definite	Germany	Hohlenstein-Stadel IV	(Hahn 1977) (Hahn 1971)
29.5-26	Definite	Hungary	Pesko cave lowest layer clay	GrN datelist 10: 63. (Allsworth-Jones 1986)
29.5-26	Definite	Hungary	Istallosko cave 9 [base]	(Vértes 1955) (Delporte 1957)
29.5-26	Definite	Hungary	Istallosko cave 9	(Vértes 1955) (Delporte 1957)
29.5-26	Definite	Hungary	Istallosko cave 9 [top]	GrN datelist 10: 63. (Vértes 1955) (Delporte 1957)
29.5-26	Definite	Italy	Abri Fumane A2 (outer)	(Bartolomei *et al.* 1992)
29.5-26	Definite	Italy	Abri Fumane A2 (inner)	(Bartolomei *et al.* 1992)
29.5-26	Definite	Italy	Riparo Mochi G	OxA datelist 18 (1994): 347.
29.5-26	Definite	Italy	Abri Fumane D6	(Bartolomei *et al.* 1992)
29.5-26	Definite	Italy	Castelcivita rsa (upper)	(Gambassini 1997)
29.5-26	Definite	Italy	Abri Fumane D3b	(Bartolomei *et al.* 1992)
29.5-26	Definite	Italy	Serino (hearth)	Radiocarbon 21: 355 (Florence datelist 4) (Mussi 1992)

Date	Aurignacian Probability	Country	Site Name	Reference
29.5-26	Definite	Italy	Gr. Paglicci 24B2-1	
29.5-26	Definite	Italy	Castelcivita gic	Radiocarbon 31: 354 [Florence datelist 4 (Gambassini 1997)
29.5-26	Definite	Italy	Castelcivita tg.29-30	
29.5-26	Definite	Italy	Abri Fumane A1	(Bartolomei *et al.* 1992)
29.5-26	Definite	Poland	Spadzista St. A [humic soil, stillfried B]	(Kozlowski 2000)
29.5-26	Definite	Romania	Mitoc Malul Galben 8b [-8.0m] [sq. B4]	(Honea 1986) (Chirica 1986)
<26	Definite	Romania	Mitoc Malul Galben 11 sup. [-9.8m] [sq. D5]	OxA datelist 11 (1990) (Honea 1986) (Chirica 1986)
<26	Definite	Romania	Mitoc Malul Galben 12b [-12.26-12.38m] [sq. J01]	(Honea 1986) (Chirica 1986)
<26	Definite	Russia	Kostienki I cultural layer 3	(Soffer 1989) (Hahn 1977)
<26	Definite	Russia	Jabrud I 6	GrN datelist 10: 49
<26	Definite	Spain	La Vina XIII [lower]	OxA datelist 24: 457.
<26	Definite	Spain	La Guelga lower black level [cave interior]	
<26	Definite	Spain	Reclau Viver T III	(Canal i Roquet and Carbonell i Roura 1989d)
<26	Definite	Spain	Arenillas II	Bernaldo de Quiros, pers. comm.
<26	Definite	Spain	Labeko Koba VII (top)	
<26	Definite	Spain	Cueva Morin 7/6	(Gonzalez Echegaray and Freeman 1978) (Bernaldo de Quiros and Moure-Romanillo 1978)
<26	Definite	Spain	Mollet Cave 0.6-0.8m	OxA datelist 18 (1994) (Canal i Roquet and Carbonell i Roura 1989c) (Maroto *et al.* 1996)
<26	Definite	Spain	Labeko Koba V	
<26	Definite	Spain	Abric Romani 2	(Canal i Roquet and Carbonell i Roura 1989a) (Bischoff *et al.* 1994) (Maroto *et al.* 1996)

Date	Aurignacian Probability	Country	Site Name	Reference
<26	Definite	Spain	Ruso [I] 5a	
<26	Definite	Spain	L'Arbreda B1*[Level H?]	(Canal i Roquet and Carbonell i Roura 1989b) (Bischoff *et al.* 1989) (Soler i Masferrer and Maroto i Genover 1987) (Maroto *et al.* 1996)
<26	Definite	Spain	Castillo 18C	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
<26	Definite	Spain	Castillo 18B2	OxA datelist 18 (1994) (Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
<26	Definite	Spain	Castillo 16	(Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
<26	Definite	Spain	Castillo 18B2 [upper]	(Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
<26	Definite	Spain	Castillo 18B1 [upper]	(Cabrera Valdes and Bischoff 1989) (Cabrera-Valdés *et al.* 1996) (Cabrera Valdés 1984)
<26	Definite	Turkey	Ucagizli Magara C	(Minzoni-Déroche 1992) (Kuhn *et al.* 1999) (Kuhn *et al.* 2001)
<26	Definite	U.K.	Tornewton Cave	OxA datelist 22 (1996)
<26	Definite	U.K.	Kent's Cavern cave earth A2	(Campbell 1977) (Aldhouse-Green and Pettitt 1998)
<26	Probable	Austria	Krems-Galgenberg	(Bednarik 1989)
<26	Probable	Belgium	Trou Magrite 3	(Otte and Straus 1995)
<26	Probable	Belgium	Trou Magrite 2 base	(Otte and Straus 1995)
<26	Probable	Russia	Kostienki XVII [Spitsyn site] 2	(Anikovich 1992)
<26	Probable	Slovenia	Divje Babe 2	(Karavanic 2000)
<26	Probable	Spain	Cueva de el Pendo VIII	Bernaldo de Quiros pers. comm. (Gonzalez Echegaray 1980)
<26	Probable	Spain	Cova Beneito upper [VIII]	(Iturbe and Cortell 1987) (Villaverde *et al.* 1998)

Date	Aurignacian Probability	Country	Site Name	Reference
<26	Probable	U.K.	Pin Hole Cave	OxA datelist 22 (1996) (Jacobi *et al.* 1998)
<26	Probable	U.K.	Robin Hood's Cave	OxA datelist 22 (1996)
<26	Probable	U.K.	King Arthur's Cave mammoth layer	(Taylor 1928) OxA datelist 9 (1989)
<26	Probable	U.K.	Pin Hole Cave within blade distribution	OxA datelist 7 (1988) (Jacobi *et al.* 1998)
<26	Probable	U.K.	Bench Quarry "Tunnel" cavern	OxA datelist 9 (1989) (Aldhouse-Green and Pettitt 1998)
<26	Probable	U.K.	Kent's Cavern	OxA datelist 22 (1996) (Aldhouse-Green and Pettitt 1998)
<26	Probable	U.K.	Paviland Cave [Goat's Hole]	(Aldhouse-Green and Pettitt 1998) (Swainston 2000) (Turner 2000a)
<26	Probable	U.K.	Paviland Cave [Goat's Hole] occupation horizon	OxA datelist 3 (1986) (Turner 2000a) (Swainston 2000)
<26	Unlikely	Austria	Salzofenhohle	GrN datelist 3
<26	Unlikely	France	Perte de Bramarie [Caniac du Causse]	Radiocarbon 21: 417 (Lyon datelist 8)
<26	Unlikely	France	Les Rivaux, Loc. 1 [Espaly-St-Marcel]	Radiocarbon 25(1): 77-8 (Lyon datelist 9).
<26	Unlikely	Russia	Kostienki XII [Volkovskaya] 1a	(Anikovich 1992) (Soffer 1989) (Anikovich 1992)
<26	Unlikely	U.K.	Pin Hole Cave 68	(Jacobi *et al.* 1998)
<26	Unlikely	U.K.	Pin Hole Cave 50	(Jacobi *et al.* 1998)
<26	Unlikely	U.K.	Soldier's Hole spit 16	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
<26	Unlikely	U.K.	Soldier's Hole spit 20	OxA datelist 12 (1991) (Aldhouse-Green and Pettitt 1998)
<26	Unlikely	U.K.	Pin Hole Cave 69	(Jacobi *et al.* 1998)
<26	Unlikely	U.K.	King Arthur's Cave red clay	(Taylor 1928) OxA datelist 9 (1989)
<26	Unlikely	U.K.	Hyaena Den	OxA datelist 22 (1996) (Tratman *et al.* 1971)

Date	Aurignacian Probability	Country	Site Name	Reference
<26	Unlikely	U.K.	Picken's Hole, Layer 3	Radiocarbon, 21: 340 (British Museum datelist 11) (Tratman 1964) (Stuart 1982)
<26	Unlikely	U.K.	Kent's Cavern pink cave earth	OxA datelist 6 (1987) (Aldhouse-Green and Pettitt 1998)

Bibliography.

www.multimap.com.

www.streetmap.co.uk.

Abbazzi, L., Fanfani, F., Ferretti, M. P., Rook, L., Cattani, L., Masini, F., Mallegni, F., Negrino, F., and Tozzi, C. 2000. New Human Remains of Archaic Homo sapiens and Lower Palaeolithic Industries from Visogliano (Duino Aurisina, Trieste, Italy). *Journal of Archaeological Science* **27**:1173-1186.

Adamenko, O. M., and Gladiline, V. N. 1989. Korolevo: un des plus anciens habitats acheuléens et moustériens de transcarpatie soviétique. *L'Anthropologie* **93**:689-712.

Adams, B. 1998. *The Middle to Upper Paleolithic Transition in Central Europe: The record from the Bükk Mountain region.* Oxford: British Archaeological Reports International Series 693.

Agache, R. 1963. Informations Archéologiques. Circonscription de Lille. *Gallia Préhistoire* **6**:165-180.

Agache, R. 1971. Informations Archéologiques, circonscription de Nord et Picardie. *Gallia Préhistoire* **14**:271-310.

Aguirre, E., and Carbonell, E. 2001. Early human expansions into Eurasia: The Atapuerca evidence. *Quaternary International* **75**:11-18.

Agusti, J., Oms, O., and Remacha, E. 2001. Long Plio-Pleistocene Terrestrial Record of Climate Change and Mammal Turnover in Southern Spain. *Quaternary Research* **56**:411-418.

Agustí, J., Oms, O., Parés, J. M., Martínez-Navarro, B., and Turq, A. 2000. "Dating and Correlations of early human occupation in the Baza Formation (Guadix-

Baza Basin, SE Spain)," in *Early Humans at the Gates of Europe*, 92 edition, *ERAUL*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 113-122. Liege: University of Liege.

Akerman, S. 1978. "Towards an Understanding of Emigrational Processes," in *Human Migration: Patterns and Policies*. Edited by W. H. McNeill and R. S. Adams, pp. 287-306. Bloomington: Indiana University Press.

Alberdi, M. T., Alonso, M. A., Azanza, B., Hoyos, M., and Morales, J. 2001. Vertebrate taphonomy in circum-lake environments: three cases in the Guadix-Baza Basin (Granada, Spain). *Palaeogeography, Palaeoclimatology, Palaeoecology* **165**:1-26.

Aldhouse-Green, S. 1995. "Pontnewydd Cave, Wales, a later Middle Pleistocene hominid and archaeological site: a review of stratigraphy, dating, taphonomy and interpretation," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermudez, J. L. Arsuaga, and E. Carbonell, pp. 37-55. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Aldhouse-Green, S., and Pettitt, P. 1998. Paviland Cave: contextualizing the Red Lady. *Antiquity* **72**:756-772.

Aldini, T., Antoniazzi, A., and Antoniazzi, A. 1998. "Pebble Industries of the Forlimpopoli area," in *Proceedings of the XIII International Congress of Prehistoric and Protohistoric Sciences, Forli, Italia, 8/14 September 1996*. Edited by C. Peretto and C. Giunchi, pp. 981-990. Forli: A.B.A.C.O. Edizioni.

Alfano, M. J., Barron, E. J., Pollard, D., Huntley, B., and Allen, J. R. M. 2003. Comparison of climate model results with European vegetation and permafrost during oxygen isotope stage three. *Quaternary Research* **59**:97-107.

Allee, W. C. 1938. *The Social Life of Animals.* New York: W. W. Norton and Company.

Allsworth-Jones, P. 1986. *The Szeletian and the Transition from Middle to Upper Palaeolithic in Central Europe.* Oxford: Clarendon Press.

Allsworth-Jones, P. 1990. "The Szeletian and the Stratigraphic succession in Central Europe and Adjacent Areas: Main Trends, Recent Results, and Problems for Resolution," in *The Emergence of Modern Humans: An Archaeological Perspective.* Edited by P. Mellars, pp. 160-242. Edinburgh: Edinburgh University Press.

Anconetani, P., Ferrari, M., Giusberti, G., and Peretto, C. 1995a. "Analisi dei resti ossei fratturati intenzionalmente del giacimento di Isernia La Pineta (Molise, Italia): I reperti della porzione più profonda dell'archeosuperficie T.3A del I settore di scava," in *Atti del I° Convegno Nazionale di Archeozoologia Rovigo 5-7 Marzo 1993*, pp. 55-63.

Anconetani, P., Ferrari, M., Giusberti, G., Peretto, C., and Viarello, F. 1995b. "Distribuzione dei reperti e studio archeozoologico di una nuova paleosuperficie individuata nel giacimento paleolitico di Isernia La Pineta (Molise)," in *Atti del I° Convegno Nazionale di Archeozoologia Rovigo 5-7 Marzo 1993*, pp. 65-74.

Anderson, C. M. 1987. Female Transfer in Baboons. *American Journal of Physical Anthropology* **73**:241-250.

Andrews, P., Cook, J., Currant, A., and Stringer, C. 1999. *Westbury Cave: The Natural History Museum Excavations 1976-1984.* Bristol: Western Academic and Specialist Press Ltd.

Anikovich, M. 1992. Early Upper Palaeolithic Industries of Eastern Europe. *Journal of World Prehistory* **6**:205-245.

Anisssutkine, N. K. 1987. De nouvelles données sur le paléolithique ancien de la Moldovie. *L'Anthropologie* **91**:69-74.

Anthony, D. 1997. "Prehistoric Migration as Social Process," in *Migrations and Invasions in Archaeological Explanation*, 664 edition, *British Archaeological Reports International Series*. Edited by J. Chapman and H. Hamerow, pp. 21-32. Oxford: Oxbow Books.

Anton, S. C. 2003. Natural History of *Homo erectus*. *Yearbook of Physical Anthropology* **46**:126-170.

Antoniazzi, A., Cattani, L., Cremaschi, M., Fontana, L., Peretto, C., Posenato, R., Proli, F., and Ungaro, S. 1988. Le gisement du paléolithique inférieur de Ca'Belvedere di Monte Poggiolo (Forli', Italie) (résultats préliminaires). *L'Anthropologie* **92**:629-642.

Antunes, M. T., Cardoso, J. L., and Faure, M. 1988. Présence de *Hippopotamus incognitus* au Portugal et Remarques sur les Sites Quaternaires de Mealhada. *Comunicações dos Serviços Geológicos de Portugal* **74**:165-172.

Arnaiz Alonso, M. A. 1990. Las ocupaciones de San Quirce de Rio Pisuerga: reflexiones sobre la utilizacion del espacio y sus implicaciones. *Boletin del Seminario de Estudios de Arte y Arqueologia de la Universidad de Valladolid* **56**:25-37.

Arribas, A., and Palmqvist, P. 1999. On the Ecological Connection Between Sabre-tooths and Hominids: Faunal Dispersal Events in the Lower Pleistocene and a Review of the Evidence for the First Human Arrival in Europe. *Journal of Archaeological Science* **26**:571-585.

Arrizabalaga, A., Altuna, J., Areso, P., Elorza, M., Garcia, M., Iriarte, M. J., Mariekurrena, K., Mujika, J., and Peman, E. 2003. The initial Upper Paleolithic in Northern Iberia: New evidence from Labeko Koba. *Current Anthropology* **44**:413-421.

Arsuaga, J. L., Carbonell, E., Bermudez de Castro, J. M., and Perez-Gonzalez, A. 1999. "The Pleistocene sites of the Sierra de Atapuerca (Burgos)," in *The Geological and Palaeontological heritage of Central and Eastern Iberia (Iberian Range, Spain) 1999 III International Symposium proGEO on the conservation of the geological heritage: Field Guide*. Edited by G. Melendez and C. Soria-Llop, pp. 75-94. Madrid: International Union of Geological Sciences Geosites working group.

Arsuaga, J.-L., Martinez, I., Gracia, A., Carretero, J.-M., and Carbonell, E. 1993. Three new human skulls from the Sima de los Huesos Middle Pleistocene site in Sierra de Atapuerca, Spain. *Nature* **362**:534-537.

Ascenzi, A., Biddittu, I., Cassoli, P. F., Segre, A. G., and Segre-Naldini, E. 1996. A calvarium of late Homo erectus from Ceprano Italy. *Journal of Human Evolution* **31**:409-423.

Ascenzi, A., and Segre, A. G. 1997. Resti di cranio umano del Pleistocene medio-inferiore a Ceprano. *Rendiconti dell'Academia Nazionale dei Lincei, Classe di Scienze Fisiche, Matematiche e Naturali, Serie IX* **8**:39-67.

Ascenzi, A., Mallegni, F., Manzi, G., Segre, A. G., and Segre Naldini, E. 2000. A re-appraisal of Ceprano calvaria affinities with Homo erectus, after the new reconstruction. *Journal of Human Evolution* **39**:443-450.

Ashton, N., Lewis, S. G., and Parfitt, S. 1998. *Excavations at the Lower Palaeolithic site at East Farm, Barnham, Suffolk 1989-94*. London: British Museum Press.

Ashton, N., Lewis, S. G., Keen, D. H., and Parfitt, S. A. 2000a. "Excavations at Elveden, Suffolk (TL 809804)," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 177-183. London: Quaternary Research Association.

Ashton, N., Lewis, S. G., and Parfitt, S. A. 2000b. "East Farm, Barnham, Suffolk (TL 875787)," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 165-175. London: Quaternary Research Association.

Ashton, N. M., Cook, J., Lewis, S. G., and Rose, J. 1992. *High Lodge: Excavations by G. de G. Sieveking 1962-68 and J. Cook 1988*. London: British Museum Press.

Ayres, J. M., and Clutton-Brock, T. H. 1992. River boundaries and species range size in Amazonian primates. *American Naturalist* **140**:531-537.

Bailey, G. N. 1983. Concepts of time in Quaternary Prehistory. *Annual Review of Anthropology* **12**:165-192.

Bailey, R. G. 1996. *Ecosystem Geography*. New York: Springer Press.

Bailloud, G. 1953. Note préliminaire sur l'industrie des niveaux supérieurs de la Grotte du Renne, à Arcy-sur-Cure (Yonne). *Bulletin de la Société Préhistorique Française* **50**:338-345.

Baïssas, P. 1972. Étude sédimentologique sommaire du remplissage de la grotte d'Aldène (Cesseras, Hérault). *Bulletin du Musée d'Anthropologie Préhistorique de Monaco* **18**:69-88.

Balout, L., Biberson, P., and Tixier, J. 1967. L'Acheuléen de Ternifine (Algérie), gisement de l'Atlanthrope. *L'Anthropologie* **71**:217-238.

Baltz, D. M., and Moyle, P. B. 1993. Invasion Resistance to Introduced Species by a Native Assemblage of California Stream Fishes. *Ecological Applications* **3**:246-255.

Banesz, L. 1998. "Consideration of the Aurignacian in Anatolia and the Near East," in *Préhistoire d'Anatolie: Genèse de deux mondes. Actes du colloque international Liège, 28 avril-3 mai 1997. Volume II.* Edited by M. Otte, pp. 599-602. Liege: University of Liege ERAUL 85.

Barral, L., and Simone, S. 1972. Le Mindel-Riss et le Riss a la grotte d'Aldène (Cesseras, Hérault). *Bulletin du Musée d'Anthropologie Préhistorique de Monaco* **18**:45-68.

Barral, L., and Simone, S. 1983. Le bassin fluvio-lacustre de Venosa (Basilicate, Italie). *Bulletin du Musée d'Anthropologie Préhistorique de Monaco* **27**:5-19.

Barrett, S. C. H., and Richardson, B. J. 1986. "Genetic Attributes of Invading Species," in *Ecology of Biological Invasions*. Edited by R. H. Groves and J. J. Burdon, pp. 21-33. Cambridge: Cambridge University Press.

Barron, E., van Andel, T. H., and Pollard, D. 2003. "Glacial Environments II: Reconstructing the Climate of Europe in the Last Glaciation," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 57-78. Cambridge: McDonald Institute for Archaeological Research.

Bartolomei, G., Broglio, A., Cattani, L., Cremaschi, M., Lanzinger, M., and Leonardi, P. 1983. Risultati preliminari delle nuove ricerche nella Grotta di Piana. *Jahrbuch des Bernischen Historischen Museums* **63-64**:43-54.

Bartolomei, G., Broglio, A., Cassoli, P. F., Castelletti, L., Cattani, L., Cremaschi, M., Giacobini, G., Malerba, G., Maspero, A., Peresani, M., Sartorelli, A., and Tagliacozzo, A. 1992. La Grotte de Fumane. Un site aurignacien au pied des Alpes. *Preistoria Alpina* **28**:131-179.

Barton, N. H. 1988. "Speciation," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions.* Edited by A. A. Myers and P. S. Giller, pp. 185-218. London: Chapman and Hall.

Barton, R. N. E., Currant, A. P., Fernandez-Jalvo, Y., Finlayson, J. C., Goldberg, P., Macphail, R., Pettitt, P., and Stringer, C. B. 1999. Gibraltar Neanderthals and results of recent excavations in Gorham's, Vanguard and Ibex Caves. *Antiquity* **73**:13-23.

Bar-Yosef, O., and Goren-Inbar, N. 1993. *The Lithic Assemblages of Ubiediya.* Jerusalem: The Hebrew University of Jerusalem.

Bar-Yosef, O. 1994. The Lower Paleolithic of the Near East. *Journal of World Prehistory* **8**:211-265.

Bar-Yosef, O. 1998. "Early colonizations and cultural continuities in the Lower Palaeolithic of western Asia," in *Early Human Behaviour in Global Context: The Rise and Diversity of the Lower Palaeolithic Record.* Edited by M. D. Petraglia and R. Korisettar, pp. 221-279. London: Routledge.

Bar-Yosef, O., and Kuhn, S. L. 1999. The big deal about blades: Laminar technologies and human evolution. *American Anthropologist* **101**:322-338.

Bastin, B., Lévêque, F., and Pradel, L. 1976. Mise en évidence de spectres polliniques interstadiaires entre le Moustérien et le Périgordien ancien de la grotte des Cottés (Vienne). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **282**:1261-1264.

Bazile, F. 1976. Datations absolues sur les niveaux paléolithiques supérieurs anciens de la grotte de l'Esquicho-Grapaou (Sainte-Anastasie, Gard). *Bulletin de la Société Préhistorique Française* **73**:205-207.

Bazile, F. 1984. Les industries du Paléolithique Supérieur en Languedoc oriental. *L'Anthropologie* **88**:77-88.

Bazzaz, F. A. 1986. "Life history of colonizing plants: Some demographic, genetic, and physiological features," in *Ecology of Biological Invasions of North America and Hawaii.* Edited by H. A. Mooney and J. A. Drake, pp. 96-110. New York: Springer-Verlag.

Beden, M., and Guth, C. 1970. Nouvelles découvertes de restes de Mammifères dans le gisement villafranchien de Chilhac (Haute-Loire). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **270**:2065-2067.

Bednarik, R. 1989. The Galgenberg figurine from Krems, Austria. *Rock Art Research* **6**:118-125.

Belichon, S., Clobert, J., and Massot, M. 1996. Are there differences in fitness components between philopatric and dispersing individuals? *Acta Oecologica* **17**.

Bell, M., and Boardman, J. Editors. 1992. *Past and present soil erosion: archaeological and geographical perspectives. Oxbow Monographs 22.* Oxford: Oxbow Books.

Belli, G., Belluomini, G., Cassoli, P. F., Cecchi, S., Cucarzi, M., Delitala, L., Fornaciari, G., Mallegni, F., Piperno, M., Segre, A. G., and Segre-Naldini, E. 1991. Découverte d'un fémur humain acheuléen à Notarchirico (Venosa, Basilicate). *L'Anthropologie* **95**:47-88.

Belmaker, M., Tchernov, E., Condemi, S., and Bar-Yosef, O. 2002. New evidence for hominid presence in the Lower Pleistocene of the Southern Levant. *Journal of Human Evolution* **43**:43-56.

Berkman, P. A., Garton, D. W., Haltuch, M. A., Kennedy, G. W., and Febo, L. R. 2000. Habitat shift in invading species: zebra and quagga mussel population characteristics on shallow soft substrates. *Biological Invasions* **2**:1-6.

Bermudez de Castro, J. M., Arsuaga, J. L., Carbonell, E., Rosas, A., Martinez, I., and Mosquera, M. 1997. A Hominid from the Lower Pleistocene of Atapuerca, Spain: Possible Ancestor to Neanderthals and Modern Humans. *Science* **276**:1392-1395.

Bermudez de Castro, J. M., Carbonell, E., Caceres, I., Diez, J. C., Fernandez-Jalvo, Y., Mosquera, M., Olle, A., Rodriguez, J., Rodriguez, X. P., Rosas, A., Rosell, J., Sala, R., Verges, J. M., and van der Made, J. 1999. The TD6 (Aurora stratum) hominid site. Final remarks and new questions. *Journal of Human Evolution* **37**:695-700.

Bermúdez de Castro, J. M., Martinón-Torres, M., Carbonell, E., Sarmiento, S., Rosas, A., van der Made, J., and Lozano, M. 2004. The Atapuerca sites and Their Contribution to the Knowledge of Human Evolution in Europe. *Evolutionary Anthropology* **13**:25-41.

Bernaldo de Quiros, F., and Moure-Romanillo, A. 1978. "Chronologia del paleolitico y el epipaleolitico peninsulares," in *C-14 y Prehistoria de la Peninsula Iberica*. Edited by M. Almagro-Gorbea and M. Fernandez-Miranda, pp. 17-35. Castello: Fundacion Juan March.

Besançon, J., Copeland, L., and Hours, F. 1970. L'Acheuléen de Joub Jannine II: Compte-rendu d'un sondage effectué en 1968. *Bulletin du Musée de Beyrouth* **23**:9-24.

Besançon, J., Copeland, L., Hours, F., and Sanlaville, P. 1977. Sur le Quaternaire de la région de Lattaquié (Syrie). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **284**:1971-1974.

Besançon, J., Copeland, L., and Hours, F. 1982. L'Acheuléen Moyen de Joubb Jannine (Liban). *Paléorient* **8**:11-36.

Biddittu, I., and Cassoli, P. 1968. Una stazione del Paleolitico inferiore a Pontecorvo in Provincia di Frosinone. *Quaternaria* **10**:167-197.

Biddittu, I. 1972. Pleistocene e industrie litiche pre-acheuleane ad Arce e Fontana Liri (Frosinone). *Quaternaria* **16**:35-52.

Biddittu, I. 1974. Giacimenti Pre-Acheuleani di Castro dei Volsci (Frosinone). *Memoire dell'Instituto Italiano di Paleontologia Umana* **2**:51-60.

Biddittu, I., Cassoli, P. F., Radicati di Brozolo, F., Segre, A. G., Segre Naldini, E., and Villa, I. 1979. Anagni, a K-Ar dated Lower and Middle Pleistocene Site, Central Italy: Preliminary Report. *Quaternaria* **21**:53-71.

Binford, L. R. 1981. *Bones: Ancient Men and Modern Myths.* New York: Academic Press.

Bischoff, J. L., Soler, N., Maroto, J., and Julia, R. 1989. Abrupt Mousterian/Aurignacian 14-C dates from L'Arbreda Cave (Catalunya, Spain). *Journal of Archaeological Science* **16**:563-576.

Bischoff, J. L., Ludwig, K., Garcia, J. F., Carbonell, E., Vaquero, M., Stafford, T. W. J., and Jull, A. J. T. 1994. Dating of the Basal Aurignacian Sandwich at Abric

Romani (Catalunya, Spain) by Radiocarbon and Uranium-Series. *Journal of Archaeological Science* **21**:541-551.

Bischoff, J. L., Fitzpatrick, J. A., Leon, L., Arsuaga, J. L., Falgueres, C., Bahain, J.-J., and Bullen, T. 1997. Geology and preliminary dating of the hominid-bearing sedimentary fill of the Sima de los Huesos Chamber, Cueva Mayor of the Sierra de Atapuerca, Burgos, Spain. *Journal of Human Evolution* **33**:129-154.

Bischoff, J. L., Shamp, D. D., Aramburu, A., Arsuaga, J. L., Carbonell, E., and Bermudez de Castro, J. M. 2003. The Sima de los Huesos Hominids Date to Beyond U/Th Equilibrium (>350 kyr) and Perhaps to 400-500 kyr: New Radiometric Dates. *Journal of Archaeological Science* **30**:275-280.

Bishop, M. J. 1975. Earliest record of Man's presence in Britain. *Nature* **253**:95-97.

Blanc, A. C. 1935. Scheggia di tecnica clactoniana rinvenuta in situ nel Quaternario della Valchetta-Cartoni (Roma). *Rivista di Antropologia* **31**:253-266.

Bocquet-Appel, J.-P., and Demars, P.-Y. 2000. Neanderthal contraction and modern human colonization of Europe. *Antiquity* **74**:544-552.

Boeda, E., and Kervazo, B. 1991. "Une vieille industrie du Sud-Ouest de la France: le niveau inférieur de Barbas (Dordogne)," in *Les Premiers Européens. Actes du 114e Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 27-38. Paris: Editions du C.T.H.S.

Bon, F. 1993. "L'Industrie lithique aurignacienne de la couche 2A de la grotte des hyènes à Brassempouy (Landes)," in *Pyrénées Préhistoriques: arts et sociétés. Actes du 118e congrés national des sociétés historiques et scientifiques*. Edited by H. Delporte and J. Clottes, pp. 439-455. Paris: Editions du C.T.H.S.

Bonifay, E. 1968. "Stratigraphie des industries lithiques de la grotte no. 1 du Mas des Caves à Lunel-Viel (Hérault)," in *La Préhistoire. Problèmes et Tendences.*

Edited by F. Bordes and D. de Sonneville-Bordes, pp. 37-46. Paris: Editions du C.N.R.S.

Bonifay, E. 1976. "Grottes du Mas des Caves (Lunel-Viel, Hérault)," in *Livret-Guiude de l'excursion C2: Provence et Languedoc Méditerranéen sites Paléolithiques et Néolithiques*. Edited by H. de Lumley, pp. 197-204. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Bonifay, E., and Bonifay, M.-F. 1981. "Le gisement préhistorique de Soleilhac (Blanzac, Haute-Loire)," in *Le Bassin du Puy aux temps préhistoriques. Recherches récentes*. Edited by F.-X. Amprimoz, pp. 19-36. Le Puy-en-Velay: Museé Crozatier.

Bonifay, E. 1991. "Les premières industries du Sud-Est de la France et du Massif central," in *Les Premiers Européens. Actes du Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 63-80. Paris: Editions du C.T.H.S.

Bonifay, M.-F., and Bonifay, E. 1963. Un gisement à faune épi-villafranchienne à Saint-Estève-Janson (Bouches-du-Rhône). *Comptes Rendus de l'Academie de Sciences de Paris* **256**:1136-1138.

Bonifay, M.-F. 1980. Relations entre les données isotopiques océaniques et l'histoire des grandes faunes européennes plio-pleistocenes. *Quaternary Research* **14**:251-262.

Bonifay, M.-F. 1986. Intérêt des études taphonomiques au Pléistocène ancien: Soleilhac et Ceyssaguet (Blanzac, Haute-Loire). *Bulletin du Muséum National d'Histoire Naturelle section C* **8**:269-281.

Bonifay, M.-F. 1996. "The importance of mammalian faunas from the early Middle Pleistocene of France," in *The early Middle Pleistocene in Europe*. Edited by C. Turner, pp. 255-262. Rotterdam: Balkema.

Bordes, F., and Labrot, J. 1967. La stratigraphie du gisement de Roc de Combe (Lot) et ses implications. *Bulletin de la Société Préhistorique Française* **64**:15-28.

Bordes, F., and Viguier, C. 1969. Présence de galets taillés de type ancien dans la région de Carmona (Province de Séville, Espagne). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **269**:1946-1947.

Bosinski, G. 1995a. "Subdivision of the Pleistocene in the Rhineland," in *Quaternary field trips in Central Europe vol.2*. Edited by W. Schirmer, pp. 838-844. Munich: Verlag Dr. Friedrich Pfeil.

Bosinski, G. 1995b. "The earliest occupation of Europe: Western Central Europe," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 103-128. Leiden: University of Leiden Press.

Bouchud, J. 1961. Étude de la faune du gisement des Cottés (Haute-Vienne). *L'Anthropologie* **65**:258-270.

Boudjemadi, K., Lecomte, J., and Clobert, J. 1999. Influence of connectivity on demography and dispersal in two contrasting habitats: an experimental approach. *Journal of Animal Ecology* **68**:1207-1224.

Bourdier, F. 1962. Existe-t-il des traces d'action humaine sur les ossements de mammifères villafranchiens de Saint-Prest? *Bulletin de la Société Préhistorique Française* **59**:310-313.

Bourdier, F. 1969. Excursion dans le bassin de Paris de l'Association Internationale pour l'étude du Quaternaire du 18 au 28 août 1969: étude comparée des dépôts quaternaires des bassins de la Seine et de la Somme. *Bulletin d'Information des Géologues du Bassin de Paris* **21**:169-231.

Bourdier, F. 1974. Le Complexe Mindelien: I- La haute terrasse de la Somme. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **40-41**:165-168.

Bourdier, F., Chaline, J., Munaut, A. V., and Puissegur, J. J. 1974a. Le complexe Mindelien: II- La moyenne terrasse de l'Avre. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **40-41**:168-180.

Bourdier, F., Chaline, J., Munaut, A. V., and Puissegur, J.-J. 1974b. Le Quaternaire Moyen: La très haute nappe alluviale de la Somme. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **40-41**:137-143.

Bourdier, F. 1976a. "Les industries paléolithiqes anté-würmiennes dans le Nord-Ouest," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 956-963. Paris: Centre National de la Recherche Scientifique.

Bourdier, F. 1976b. "Introduction historique et géologique à la préhistoire du Nord-Ouest de la France," in *Livret-Guide de l'excursion A10: Nord-Ouest de la France (Bassin de la Seine, Bassin de la Somme et Nord)*. Edited by G. Verron, pp. 17-28. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Bouvier, J. M., and Rousseau, J. M. 1972. Fragment crânien humain d'âge rissien (?) des alluvions de la Dordgne. *L'Anthropologie* **76**:325-330.

Bovier-Lapierre, M. P. 1925. Le paléolithique stratifié des environs du Caire. *L'Anthropologie* **35**:37-46.

Bovier-Lapierre, R. P. P. 1926. Les Gisements Paléolithiques de la Plaine de l'Abbassieh. *Bulletin de l'Institut d'Égypte* **8**:257-275.

Bracco, J.-P. 1991. "Typologie, technologie et matières premières des industries du très ancien Paléolithique en Velay (Massif central, France)," in *Les Premiers Européens. Actes du Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 93-100. Paris: Editions du C.T.H.S.

Bravo-Ureta, B. E., Quiroga, R. E., and Brea, J. A. 1996. Migration Decisions, Agrarian Structure, and Gender: The Case of Ecuador. *Journal of Developing Areas* **30**:463-475.

Bridgland, D. R., and Harding, P. 1987. "Palaeolithic sites in tributary valleys of the Solent River," in *Wessex and the Isle of Wight. Field Guide*. Edited by K. E. Barber, pp. 45-55. Cambridge: Quaternary Research Association.

Bridgland, D. R. 1994. *Quaternary of the Thames*. London: Chapman and Hall.

Bridgland, D. R. 1998. "The Pleistocene History and Early Human Occupation of the River Thames Valley," in *Stone Age Archaeology: Essays in honour of John Wymer*. Edited by N. Ashton, F. Healy, and P. Pettitt, pp. 29-37. Oxford: Oxbow Books.

Bridgland, D. R., Keen, D. H., Schreve, D. C., and White, M. J. 1998a. "Fordwich," in *The Quaternary of Kent and Sussex. Field Guide*. Edited by J. B. Murton, C. A. Whiteman, M. R. Bates, D. R. Bridgland, A. J. Long, M. B. Roberts, and M. P. Waller, pp. 41-42. London: Quaternary Research Association.

Bridgland, D. R., Keen, D. H., Schreve, D. C., and White, M. J. 1998b. "Summary: dating and correlation of the Stour sequence," in *The Quaternary of Kent and Sussex. Field Guide*. Edited by J. B. Murton, C. A. Whiteman, M. R. Bates, D. R. Bridgland, A. J. Long, M. B. Roberts, and M. P. Waller, pp. 53-54. London: Quaternary Research Association.

Bridgland, D. R. 2001. "The Pleistocene evolution and Palaeolithic occupation of the Solent River," in *Palaeolithic Archaeology of the Solent River*. Edited by F. F. Wenban-Smith and R. T. Hosfield, pp. 15-25. London: Lithic Studies Society Occasional Paper No. 7.

Briggs, J. C. 2000. Centrifugal speciation and centres of origin. *Journal of Biogeography* 27:1183-1188.

Bright, C. 1999. *Life Out of Bounds: Bioinvasion in a Borderless World*. London: Earthscan Publications Ltd.

Broglio, A., and Laplace, G. 1966. Études de typologie analytique des complexes leptolithiques de l'Europe centrale. I. Les complexes aurignacoïdes de la Basse Autriche. *Rivista di Scienze Preistoriche* **21**:61-119.

Brooks, A. S. 1995. "L'Aurignacien de l'abri Pataud niveaux 6 à 14," in *Le Paléolithique supérieur de l'Abri Pataud (Dordogne): Les fouilles de H. L. Movius, Jr.* Edited by H. M. Bricker, pp. 167-222. Paris: Edition de la Maison des Sciences de l'Homme.

Brown, J. H., and Gibson, A. C. 1983. *Biogeography*. St. Louis: C. V. Mosby Company Press.

Brugal, J.-P., Roche, H., and Kibunjia, M. 2003. Faunes et paléoenvironnements des principaux sites archéologiques plio-pléistocènes de la formation de Nachukui (Ouest-Turkana, Kenya). *C. R. Palevol* **2**:675-684.

Bucha, V., Horáèek, J., Koèí, A., Šibrava, V., and Ložek, V. 1975. "Palaeomagnetic correlations of Pleistocene sediments of Central Europe," in *Quaternary Glaciations in the Northern Hemisphere (Project 73/1/24): Report No. 2 on the session in Saltzburg (Austria), September 10-14th, 1974.* Edited by V. Šibrava, pp. 9-36. Prague: Geological Survey.

Buisson, D. 1993. "Brassempouy: Présentation du site et problèmes posés par les fouilles récentes," in *Pyrénées Préhistoriques: arts et sociétés. Actes du 118e congrés national des sociétés historiques et scientifiques.* Edited by H. Delporte and J. Clottes, pp. 423-437. Paris: Editions du C.T.H.S.

Bunn, H., and Kroll, E. 1986. Systematic butchery by Plio-Pleistocene hominids at Olduvai Gorge, Tanzania. *Current Anthropology* **27**:431-442.

Burmeister, S. 2000. Archaeology and Migration. *Current Anthropology* **41**:539-567.

Cabrera Valdes, V., and Bischoff, J. L. 1989. Accelerator 14-C dates for Early Upper Paleolithic (Basal Aurignacian) at El Castillo Cave (Spain). *Journal of Archaeological Science* **16**:577-584.

Cabrera Valdés, V. 1984. *El Yacimiento de la Cueva de <<El Castillo>> (Puente Viesgo, Santander).* Madrid: Instituto Espanol de Prehistoria.

Cabrera-Valdés, V., Valladas, H., Bernaldo de Quiros, F., and Hoyos Gomez, M. 1996. La transition Paléolithique moyen-Paléolithique supérieur à El Castillo (Cantabrie): nouvelles datations par le carbone-14. *Comptes Rendus de l'Academie de Sciences de Paris serie IIA* **322**:1093-1098.

Cachel, S., and Harris, J. W. K. 1998. "The lifeways of Homo erectus inferred from archaeology and evolutionary ecology: a perspective from East Africa," in *Early Human Behaviour in Global Context: The Rise and Diversity of the Lower Palaeolithic Record.* Edited by M. D. Petraglia and R. Korisettar, pp. 108-132. London: Routledge.

Cahen, D. 1984. "Paléolithique inférieur et moyen en Belgique," in *Peuples chausseurs de la Belgique préhistorique dans leur cadre naturel.* Edited by D. Cahen and P. Haesaerts, pp. 133-155. Bruxelles: Institut royal des Sciences naturelles de Belgique.

Caloi, L., and Palombo, M. R. 1979. La fauna quaternaria di Venosa: Canis sp. *Quaternaria* **21**:115-128.

Campbell, J. B., and Sampson, C. G. 1971. *A New Analysis of Kent's Cavern, Devonshire, England.* Oregon: University of Oregon Anthropological Papers No. 3.

Campbell, J. B. 1977. *The Upper Palaeolithic of Britain. A Study of Man and Nature in the Late Ice Age*. Oxford: Clarendon Press.

Canal i Roquet, J., and Carbonell i Roura, E. 1989a. "Abric Romaní (Capellades, Anoia)," in *Catalunya Paleolitica.* Edited by J. Canal i Roquet and E. Carbonell i Roura, pp. 364-271. Gerona: Patronat Francesc Eiximenis.

Canal i Roquet, J., and Carbonell i Roura, E. 1989b. "L'Arbreda (Serinyà-Gironès)," in *Catalunya Paleolitica.* Edited by J. Canal i Roquet and E. Carbonell i Roura, pp. 322-334. Gerona: Patronat Francesc Eiximenis.

Canal i Roquet, J., and Carbonell i Roura, E. 1989c. "Mollet (Serinyà. El Pla de l'Estany)," in *Catalunya Paleolitica.* Edited by J. Canal i Roquet and E. Carbonell i Roura, pp. 310-320. Gerona: Patronat Francesc Eiximenis.

Canal i Roquet, J., and Carbonell i Roura, E. 1989d. "Reclau Viver (Serinyà. El Pla de l'Estany)," in *Catalunya Paleolitica.* Edited by J. Canal i Roquet and E. Carbonell i Roura, pp. 335-340. Girona: Patronat Francesc Eiximenis.

Canal i Roquet, J., and Carbonell i Roura, E. 1989e. *Catalunya Paleolitica.* Gerona: Patronat Francesc Eiximenis.

Carbonell, E., Estevez, J., and Gusi, F. 1979. Resultados preliminares de los trabajos efectuados en el yacimiento del Pleistoceno Medio de Cau d'en Borrás (Orpesa, Castellón). *Cuadernos de Prehistoria y Arqueología Castellonenses* **6**:7-17.

Carbonell, E., Estevez, J., Moya-Sola, S., Pons-Moya, J., Agusti, J., and de Villalta, J. F. 1981. Cueva Victoria (Murcia, España): lugar de ocupación humana más antiguo de la península ibérica. *Endins* **8**:47-57.

Carbonell, E., Diez, C., Enamorado, J., and Ortega, A. 1987. Análysis morfotécnico de la industria lítica de Torralba (Soria). *Cuadernos Sección Antropología-Etnografía* **4**:201-216.

Carbonell, E., Collina-Girard, J., Guilbaud, M., Mora, R., and Sala, R. 1988. Le gisement Pléistocène moyen de Puig d'en Roca (Espagne). *Bulletin de la Société Préhistorique Française* **85**:204-209.

Carbonell, E., and Rodriguez, X. P. 1994. Early Middle Pleistocene deposits and artefacts in the Gran Dolina site (TD4) of the Sierra de Atapuerca (Burgos, Spain). *Journal of Human Evolution* **26**:291-311.

Carbonell, E., Bermudez de Castro, J. M., Arsuaga, J. L., Diez, J. C., Rosas, A., Cuenca Bescos, G., Sala, R., Mosquera, M., and Rodriguez, X. P. 1995a. Lower Pleistocene Hominids and Artifacts from Atapuerca-TD6 (Spain). *Science* **269**:826-829.

Carbonell, E., Giralt, S., Marquez, B., Martin, A., Mosquera, M., Olle, A., Rodriguez, X. P., Sala, R., Vaquero, M., Verges, J. M., and Zaragoza, J. 1995b. "The Litho-Technical Assemblage of the Sierra de Atapuerca in the frame of the European Middle Pleistocene," in *Human Evolution in Europe and the Atapuerca Evidence.* Edited by J. M. Bermudez, J. L. Arsuaga, and E. Carbonell, pp. 445-533. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Carbonell, E., Mosquera, M., Rodriguez, X. P., and Sala, R. 1995c. The first human settlement of Europe. *Journal of Anthropological Research* **51**:107-114.

Carbonell, E., Olle, A., Rodriguez, X. P., Sala, R., Vaquero, M., Verges, J. M., Marquez, B., and Mosquera, M. 1995d. Atapuerca Trinchera Galeria (Spain): Strategies and operational models of lithic industry. *Cahier Noir* 7:41-83.

Carbonell, E., and Vaquero, M. 1996. "Introduction. Human evolution and cultural change 40.000 years ago. Evolution or revolution?," in *The Last Neanderthals, The First Anatomically Modern Humans: A Tale about the Human Diversity. Cultural Change and Human Evolution: The Crisis at 40Ka BP.* Edited by E. Carbonell and M. Vaquero, pp. 9-18: Grafiques Lluc.

Carbonell, E., and Vaquero, M. 1998. Behavioral complexity and biocultural change in Europe around forty thousand years ago. *Journal of Anthropological Research* **54**:373-397.

Carbonell, E., Esteban, M., Najera, A. M., Mosquera, M., Rodriguez, X. P., Olle, A., Sala, R., Verges, J. M., Bermudez de Castro, J. M., and Ortega, A. 1999a. The Pleistocene site of Gran Dolina, Sierra de Atapuerca, Spain: a history of the archaeological investigations. *Journal of Human Evolution* **37**:313-324.

Carbonell, E., Garcia-Anton, M. D., Mallol, C., Mosquera, M., Olle, A., Rodriguez, X. P., Sahnouni, M., Sala, R., and Verges, J. M. 1999b. The TD6 level lithic industry from Gran Dolina, Atapuerca (Burgos, Spain): production and use. *Journal of Human Evolution* **37**:653-693.

Carbonell, E., Mosquera, M., Rodriguez, X. P., Sala, R., and van der Made, J. 1999c. Out of Africa: The Dispersal of the Earliest Technical Systems Reconsidered. *Journal of Anthropological Archaeology* **18**:119-136.

Carbonell, E., Mosquera, M., Ollé, A., Rodríguez, X. P., Sahnouni, M., Sala, R., and Verges, J. M. 2001. Structure morphotechnique de l'industrie lithique du

Pléistocène inférieur et moyen d'Atapuerca (Burgos, Espagne). *L'Anthropologie* **105**:259-280.

Carbonell Roura, E. 1992. "Premieres occupations humaines dans la peninsule Iberique (Espagne)," in *Il più antico popolamento della valle Padana nel quadro delle conoscenze Europee Monte Poggiolo.* Edited by C. Peretto, pp. 27-40. Milan: Jaca Books.

Carr, D. 1986. *Time, Narrative and History.* Bloomington: Indiana University Press.

Case, T. J. 1991. Invasion resistance, species build-up and community collapse in metapopulation models with interspecies competition. *Biological Journal of the Linnean Society* **42**:239-266.

Castles, S., and Miller, M. J. 1993. *The Age of Migration: International Population Movements in the Modern World.* London: MacMillan Press.

Cattani, L., Cremaschi, M., Ferraris, M. R., Mallegni, F., Masini, F., Scola, V., and Tozzi, C. 1991. Le gisement du pléistocène moyen de Visogliano (Trieste): restes humains, industries, environnement. *L'Anthropologie* **95**:9-36.

Chabai, V. P. 1998. "The Middle Paleolithic to Aurignacian transition in the Crimea," in *Préhistoire d'Anatolie: Genèse de deux mondes. Actes du colloque international Liège, 28 avril-3 mai 1997. Volume II.* Edited by M. Otte, pp. 339-352. Liege: University of Liege ERAUL 85.

Chaline, J. 1983. Les rongeurs, les paléoenvironnements et les climats du Pléistocène moyen de Vergranne (Doubs). *Annales Scientifiques de l'Université de Besançon 4ème série.*

Champagne, F., Champagne, C., Jauzon, P., and Novel, P. 1990. Le site préhistorique des fieux à Miers (Lot). État actuel des recherches. *Gallia Préhistoire* **32**:1-28.

Channell, R., and Lomolino, M. V. 2000. Trajectories to extinction: spatial dynamics of the contraction of geographical ranges. *Journal of Biogeography* **27**:169-179.

Chapman, J., and Hamerow, H. 1997. "Introduction: On The Move Again- Migrations and Invasions in Archaeological Explanation," in *Migrations and Invasions in Archaeological Explanation.* Edited by J. Chapman and H. Hamerow, pp. 1-10. Oxford: British Archaeological Reports International Series 664.

Chazan, M. 2000. Flake production at the Lower Palaeolithic site of Holon (Israel): implications for the origin of the Levallois method. *Antiquity* **74**:495-499.

Chirica, V. 1986. "La chronologie relative et absolue des habitats aurignaciens et gravettiens de la Roumanie," in *The Pleistocene Perspective. Volume 1. The World Archaeological Congress, 1-7th September 1986.* London: Allen and Unwin.

Chlachula, J. 1993. Le paléolithique inférieur dans le bassin de la Morava (Moravie du sud). *L'Anthropologie* **97**:499-510.

Chlachula, J. 1994. Le site paléolithique ancien de la localité Staré Mesto (site I), sud-est de la Moravie, République Tchèque. *L'Anthropologie* **98**:329-363.

Churcher, C. S., Kleindienst, M. R., and Schwarcz, H. P. 1999. Faunal remains from a Middle Pleistocene lacustrine marl in Dakhleh Oasis, Egypt: palaeoenvironmental reconstructions. *Palaeogeography, Palaeoclimatology, Palaeoecology* **154**:301-312.

Clark, G. 1977. *World Prehistory in New Perspective. Third Edition.* Cambridge: Cambridge University Press.

Clark, G. A. 1989. Alternative models of Pleistocene biocultural evolution: a response to Foley. *Antiquity* **63**:153-162.

Clark, G. A. 2001. "The Logic of Inference in Transition Research," in *Questioning the Answers: Re-solving Fundamental Problems of the Early Upper Paleolithic.* Edited by M. A. Hays and P. T. Thacker, pp. 39-47. Oxford: British Archaeological Reports International Series 1005.

Clarke, R. J. 2000. A corrected reconstruction and interpretation of the Homo erectus calvaria from Ceprano, Italy. *Journal of Human Evolution* **39**:433-442.

Cohen, V. Y., and Stepanchuk, V. N. 1999. Late Middle and Early Upper Paleolithic Evidence from the East European Plain and Caucasus: A New Look at Variability, Interactions, and Transitions. *Journal of World Prehistory* **13**:265-319.

Collina-Girard, J. 1978. Évolution des industries à galets aménagés de la vallée de la Têt (Pyrénées-Orientales). *Bulletin de la Société Préhistorique Française* **75**:172-180.

Commont, M. V. 1908. Les industries de l'ancien Saint-Acheul. *L'Anthropologie* **14**:527-572.

Conard, N. J., and Bolus, M. 2001. "The pattern and timing of the colonization of Europe by modern humans," in *Advances in the Study of Human Evolution and Dispersal: An international symposium held at the University of Tubingen, Germany, 8-12th April 2001.*

Conard, N. J., and Bolus, M. 2003. Radiocarbon dating the apperance of modern humans and timing of cultural innovations in Europe: new results and new challenges. *Journal of Human Evolution* **44**:331-371.

Conkey, M. W. 2001. "Hunting for images, gathering up meanings: art for life in hunting-gathering societies," in *Hunter-gatherers: an interdisciplinary* *perspective*. Edited by C. Panter-brick, R. H. Layton, and P. Rowley-Conwy, pp. 267-291. Cambridge: Cambridge University Press.

Conway, B., McNabb, J., and Ashton, N. 1996. *Excavations at Barnfield Pit, Swanscombe, 1968-72*. London: British Museum Occasional Papers.

Cook, J., Ashton, N., Coope, G. R., Hunt, C. O., Lewis, S. G., and Rose, J. 1991. "High Lodge, Mildenhall, Suffolk (TL 739754)," in *Central East Anglia and the Fen Basin. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and D. R. Bridgland, pp. 59-69. London: Quaternary Research Association.

Cook, J., and Jacobi, R. 1998. "Observations on the Artefacts from the Breccia at Kent's Cavern," in *Stone Age Archaeology: Essays in honour of John Wymer*. Edited by N. Ashton, F. Healy, and P. Pettitt, pp. 77-89. Oxford: Oxbow Books.

Copeland, L., and Hours, F. 1978. La séquence acheuléenne du Nahr el Kébir- région septentrionale du littoral syrien. *Paléorient* **4**:5-31.

Copeland, L., and Hours, F. 1988. "The Paleolithic in North Central Jordan: an Overview of Survey Results from the Upper Zarqa and Azraq 1982-1986," in *The Prehistory of Jordan: The State of Research in 1986*. Edited by A. N. Garrard and H. G. Gebel, pp. 287-309. Oxford: British Archaeological Reports International Series 396.

Copeland, L., and Hours, F. 1993. "The Middle Orontes. Paleolithic flint industries," in *Le Paléolithique de la vallée moyenne de l'Oronte (Syrie): Peuplement et environnement*. Edited by P. Sanlaville, J. Besançon, L. Copeland, and S. Muhesen, pp. 63-144. Oxford: British Archaeological Reports International Series 587.

Cordy, J.-M. 1980. Le paléokarst de la Belle-Roche (Sprimont, Liège): premier gisement paléontologique du Pléistocène moyen ancien en Belgique. *Comptes Rendus de l'Academie de Sciences de Paris serie D* **291**:749-752.

Cremaschi, M., and Peretto, C. 1988a. Le Paléolithique Inférieur de la plaine orientale du Pô. *L'Anthropologie* **92**:643-682.

Cremaschi, M., and Peretto, C. 1988b. Les sols d'habitat du site paléolithique d'Isernia La Pineta (Molise, Italie centrale). *L'Anthropologie* **92**:1017-1040.

Crooks, J. A., and Soule, M. E. 1999. "Lag times in population explosions of invasive species: Causes and implications," in *Invasive Species and Biodiversity Management*. Edited by O. T. Sandlund, P. J. Schei, and A. Viken, pp. 103-125. Dordrecht: Kluwer Academic Press.

Cunha-Ribeiro, J. P. 1990. Intervenção arqueológica na estação acheulense da Quinta do Cónego/Pousias. *Portugalia* **11-12**:7-26.

Cunha-Ribeiro, J. P. 1992. Contribuição para o estudo do Paleolítico do Vale do Lis no seu contexto crono-estratigráfico. *Portugalia* **13-14**:7-137.

Cunha-Ribeiro, J. P. 1996. "The Acheulean of the Lis Valley," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula*. Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 147-150. Oxford: British Archaeological Reports International Series 649.

Czarnetzki, A. 1991. Nouvelle découverte d'un fragment de crâne d'un hominidé archaïque dans le sud-ouest de l'Allemagne (rapport préliminaire). *L'Anthropologie* **95**:103-112.

Darlas, A. 1995. "The earliest occupation of Europe: the Balkans," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation*

Workshop at Tautavel (France), 1993. Edited by W. Roebroeks and T. van Kolfschoten, pp. 51-59. Leiden: University of Leiden Press.

Darlington, P. J. J. 1957. *Zoogeography: The Gegraphical Distribution of Animals*. New York: John Wiley and Sons.

Davey, N. D. W. 1991. "A review of the Pleistocene geology of the Peterborough district," in *Central East Anglia and the Fen Basin. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and D. R. Bridgland, pp. 150-162. London: Quaternary Research Association.

Davies, W. 1999. The Aurignacian as a reflection of modern human population dispersal in Europe. Unpublished Ph.D Thesis, University of Cambridge.

Davies, W. 2001. A Very Model of a Modern Human Industry: New Perspectives on the Origins and Spread of the Aurignacian in Europe. *Proceedings of the Prehistoric Society* **67**:195-217.

Davies, W., Valdes, P., Ross, C., and van Andel, T. H. 2003. "The Human Presence in Europe during the Last Glacial Period III: Site Clusters, Regional Climates and Resource Attractions," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 191-220. Cambridge: McDonald Institute for Archaeological Research.

de Haan, A. 1999. Livelihoods and Poverty: The Role of Migration- A Critical Review of the Migration Literature. *Journal of Development Studies* **36**:1-47.

de Jong, G. F., and Fawcett, J. T. 1981. "Motivations for Migration: An Assessment and a Value-Expectancy Research Model," in *Migration Decision Making: Multidisciplinary Approaches to Microlevel Studies in Developed and*

Developing Countries. Edited by G. F. de Jong and R. W. Gardner, pp. 13-58. New York: Pergamon Press.

de Jong, G. F., and Gardner, R. W. 1981. "Introduction and Overview," in *Migration Decision Making: Multidisciplinary Approaches to Microlevel Studies in Developed and Developing Countries*. Edited by G. F. de Jong and R. W. Gardner, pp. 1-10. New York: Pergamon Press.

de Lumley, H. 1966. Les fouilles de Terra Amata à Nice. Premiers résultats. *Bulletin du Musée d'Anthropologie Préhistorique de Monaco* **13**:29-51.

de Lumley, H. 1975. "Cultural evolution in France in its palaeoecological setting during the Middle Pleistocene," in *After the Australopithecines*. Edited by K. W. Butzer and G. L. Isaac, pp. 745-808. The Hague: Mouton.

de Lumley, H. Editor. 1976. *La Préhistoire Française*. Paris: Centre National de la Recherche Scientifique.

de Lumley, H., Collina-Girard, J., Abelanet, J., Bazile, F., and Meignen, L. 1976. "Les premières industries humaines en Languedoc méditerranéen et en Roussillon," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 777-794. Paris: Centre National de la Recherche Scientifique.

de Lumley, H., Cregut, E., Guerin, C., Chaline, J., Mourer-Chauvire, C., and Cheylan, M. 1979. La Faune. *L'Homme de Tautavel. Les Dossiers de l'Archéologie* **36**:28-39.

de Lumley, H., Fournier, A., Krzepkowska, J., and Echassoux, A. 1988. L'Industrie du Pléistocène Inférieur de la Grotte du Vallonnet Roquebrune-Cap-Martin, Alpes-Maritimes. *L'Anthropologie* **92**:501-614.

de Sonneville-Bordes, D., and Mortureux, B. 1955. L'abri Caminade, commune de La Canéda (Dordogne). Etude prélliminaire. *Bulletin de la Société Préhistorique Française* **52**:608-619.

de Sonneville-Bordes, D. 1970. Les industries aurignaciennes de l'abri de Caminade-Est, commune de La Canéda (Dordogne). *Quaternaria* **13**:77-131.

Defleur, A., Onoratini, G., and Raux, A. 1991. "La station de Vidauban (Var), premier gisement du très ancien paléolithique en Provence cristalline," in *Les Premiers Européens. Actes du 114e Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 55-61. Paris: Editions du C.T.H.S.

Delpech, F. 1972. Etude paléoclimatique des faunes aurignaciennes et périgordiennes du gisement du Roc de Combe (Payrignac, Lot). *Quaternaria* **16**:247-254.

Delporte, A. 1957. Les fouilles d'Istallosko et les problèmes du Leptolithique hongrois. *Bulletin de la Société Préhistorique Française* **54**:271-279.

Delporte, H. 1963. Le gisement paléolithique de La Rochette (commune de Saint-Léon-sur-Vézère, Dordogne). *Gallia Préhistoire* **5**:1-22.

Delporte, H. 1968. L'Abri du Facteur à Tursac (Dordogne). Étude générale. *Gallia Préhistoire* **11**:1-112.

Delporte, H. 1984. *Le grand abri de la Ferrassie: Fouilles 1968-1973*. Paris: Etudes Quaternaires, Memoire No. 7.

Demars, P.-Y. 1990. "Les interstratifications entre Aurignacien et Châtelperronien a Roc-de-Combe et au Piage (Lot). Approvisionnement en matières premières et position chronologique," in *Paleolithique moyen recent et paleolithique superieur ancien en Europe. Ruptures et transitions: examen critique des* *documents archéologiques*. Edited by C. Farizy, pp. 235-239. Nemours: Mémoires du Musée de Préhistoire d'Ile de France No. 3.

Demidenko, Y. E., Chabai, V. P., Otte, M., Yevtushenko, A. I., and Tatartsev, S. V. 1998. "Siuren-1, an Aurignacian site in the Crimea (the investigations of the 1994-1996 field seasons)," in *Préhistoire d'Anatolie. Genèse de deux mondes. Volume 1. Actes du colloque international Liège, 28 avril-3 mai 1997*. Edited by M. Otte, pp. 367-413. Liege: University of Liege ERAUL 85.

Dennell, R., and Roebroeks, W. 1996. The earliest colonization of Europe: the short chronology revisited. *Antiquity* **70**:535-542.

Deocampo, D. M., Blumenschine, R. J., and Ashley, G. M. 2002. Wetland Diagenesis and Traces of Early Hominids, Olduvai Gorge, Tanzania. *Quaternary Research* **57**:271-281.

d'Errico, F., Zilhão, J., Julien, M., Baffier, D., and Pelegrin, J. 1998. Neanderthal Acculturation in Western Europe?: A Critical Review of the Evidence and Its Interpretation. *Current Anthropology* **39**:S1-S44.

d'Errico, F., and Laroulandie, V. 2000. "Bone technology at the Middle-Upper Palaeolithic Transition, the case of the worked bones from Buran-Kaya III Level C (Crimea, Ukraine)," in *Neanderthals and Modern Humans-Discussing the Transition: Central and Eastern Europe from 50.000-30.000 B.P.* Edited by J. Orschiedt and G.-C. Weniger, pp. 227-242. Mettmann: Neanderthal Museum.

d'Errico, F., and Sánchez Goñi, M. F. 2003. Neanderthal extinction and the millennial scale climatic variability of OIS 3. *Quaternary Science Reviews* **22**:769-788.

Desbrosse, R. 1978. Recherches entre Saone et Rhone en 1978. *Nouvelles Archives du Museum d'Histoire Naturelle de Lyon Supplément* **16**:63-69.

Desbrosse, R. 1985. "Périgordien et Aurignacien anciens de la Mère Clochette à Rochefort-sur-Nénon (Jura)," in *Elements de Pre- et Proto-histoire Européenne: hommages à Jacques-Pierre Millotte*. Edited by A. Bocquet, M. Campy, J. Combier, A. Thevenin, and D. Vuaillat, pp. 71-95. Paris: Annales Littéraires de l'Université de Besançon 299.

Despriée, J., and Lorain, J. M. 1982. Les industries du paléolithique inférieur et moyen de la vallée du Loir vendômois dans leur contexte géologique. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **10-11**:113-122.

di Castri, F. 1990. "On invading species and invaded ecosystems: the interplay of historical chance and biological necessity," in *Biological Invasions in Europe and the Mediterranean Basin*. Edited by F. di Castri, A. J. Hansen, and M. Debussche, pp. 3-16. Dordrecht: Kluwer Academic Press.

di Castri, F. 1991. "An ecological overview of the five regions of the world with a mediterranean climate," in *Biogeography of Mediterranean Invasions*. Edited by R. H. Groves and F. di Castri, pp. 3-16. Cambridge: Cambridge University Press.

Dibble, H. L., and Rolland, N. 1992. "On Assemblage Variability in the Middle Palaeolithic of Western Europe: History, Perspectives and a New Synthesis," in *The Middle Palaeolithic: Adaptation, Behaviour, and Variability*. Edited by H. L. Dibble and P. Mellars, pp. 1-28. Philadelphia: University of Pennsylvania Press.

Diez, J. C., Fernandez-Jalvo, Y., Rosell, J., and Caceres, I. 1999. Zooarchaeology and taphonomy of Aurora Stratum (Gran Dolina, Sierra de Atapuerca, Spain). *Journal of Human Evolution* **37**:623-652.

Djindjian, F. 1986. Recherches sur l'Aurignacien du Périgord a partir des données nouvelles de la Ferrassie. *L'Anthropologie* **90**:89-106.

Djindjian, F. 1993. "Les origines du peuplement Aurignacien en Europe," in *Aurignacien en Europe et au Proche Orient*. Edited by L. Bánesz and J. K. Kozlowski, pp. 136-154. Bratislava: Acts of the 12th International Congress of the Prehistoric and Protohistoric Sciences.

Dominguez-Rodrigo, M., Serrallonga, J., Juan-Tresserras, J., Alcala, L., and Luque, L. 2001. Woodworking activities by early humans: a plant residue analysis on Acheulean stone tools from Peninj (Tanzania). *Journal of Human Evolution* **40**:289-299.

Doronichev, V. B. 2000a. "Lower Palaeolithic Occupation of the Northern Caucasus," in *Early Humans at the Gates of Europe*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 67-77. Liege: University of Liege.

Doronichev, V. B. 2000b. "Lower Palaeolithic Occupation of the Northern Caucasus," in *Early Humans at the Gates of Europe: Proceedings of the first international symposium Dmanisi, Tbilisi (Georgia) September 1998*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 67-77. Liege: University of Liege ERAUL 92.

Draily, C. 1998. Campagnes de fouilles 1996-1998 à la grotte Walou à Trooz. *Notae Praehistoricae* **18**:25-32.

Drobniewicz, B., Ginter, B., Kazior, B., and Kozlowski, J. K. 1992. "Early Upper Palaeolithic assemblages from layer 4, trench TD-1," in *Temnata Cave: Excavations in Karlukovo Karst Area, Bulgaria, volume 2, part 1*. Edited by B. Ginter, J. K. Kozlowski, J.-L. Guadelli, and H. Laville, pp. 333-418. Krakow: Jagellonian University Press.

Drouot, E. 1953. L'Art Paléolithique à La Baume Latrone. *Cahiers Ligures de Prehistoire et Archeologie* **2**:9-46.

Dubar, M. 1975. Les formations quaternaires de la rive gauche de la Moyenne Durance, des Mées à Oraison (Alpes-de-Haute-Provence). *Géologie méditerranéenne* **2**:49-58.

Dunbar, R. I. M. 1993. The co-evolution of neocortical size, group size and the evolution of language in humans. *Behavioural and Brain Sciences* **16**:681-735.

Dunning, J. B., Stewart, D. J., Danielson, B. J., Noon, B. R., Root, T. L., Lamberson, R. H., and Stevens, E. E. 1995. Spatially Explicit Population Models: Current Forms and Future Uses. *Ecological Applications* **5**:3-11.

Džaparidze, V., Bosinski, G., Bugianišvili, T., Gabunia, L., Justus, A., Klopotoskaia, N., Kvavadze, E., Lordkipanidze, D., Majsuradze, G., Mgeladze, N., Nioradze, M., Pavlenishvili, E., Schmincke, H., Sologashvili, D., Tushabramishvili, D., Tvalchrelidze, M., and Vekua, A. 1989. Der Altpaläolithische fundplatz Dmanisi in Georgien (Kaukasus). *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* **36**:67-116.

Eeley, H. A. C., and Lawes, M. J. 1999. "Large-scale patterns of species richness and species range size in anthropoid primates," in *Primate Communities.* Edited by J. G. Fleagle, C. Janson, and K. E. Reed, pp. 191-219. Cambridge: Cambridge University Press.

Ehrlich, I., and Lui, F. 1997. The problem of population and growth: A review of the literature from Malthus to contemporary models of endogenous population and endogenous growth. *Journal of Economic Dynamics and Control* **21**:205-242.

Ehrlich, P. R. 1986. "Which Animal Will Invade?," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 79-95. New York: Springer-Verlag.

Elton, C. S. 1958. *The Ecology of Invasions by Animals and Plants*. Chicago: University of Chicago Press.

Enghoff, H. 1995. Historical Biogeography of the Holarctic: Area Relationships, Ancestral Areas, and Dispersal of Non-Marine Animals. *Cladistics* **11**:223-263.

Escalon de Fonton, M. 1966. Du Paleolithique superieur au Mesolithique dans le midi mediterraneen. *Bulletin de la Société Préhistorique Française* **63**:66-180.

Fabian, J. 1983. *Time and the Other: How Anthropology Makes its Object*. New York: Columbia University Press.

Falgueres, C., Bahain, J.-J., and Saleki, H. 1997. U-Series and ESR Dating of Teeth from Acheulean and Mousterian Levels at La Micoque (Dordogne, France). *Journal of Archaeological Science* **24**:537-545.

Falgueres, C., Bahain, J.-J., Yokoyama, Y., Arsuaga, J. L., Bermudez de Castro, J. M., Carbonell, E., Bischoff, J. L., and Dolo, J. M. 1999. Earliest humans in Europe: the age of TD6 Gran Dolina, Atapuerca, Spain. *Journal of Human Evolution* **37**:343-352.

Falguères, C., Bahain, J.-J., Yokoyama, Y., Bischoff, J. L., Arsuaga, J. L., Bermudez de Castro, J. M., Carbonell, E., and Dolo, J. M. 2001. Datation par RPE et U-Th des sites pléistocènes d'Atapuerca: Sima de los Huesos, Trinchera Dolina et Trinchera Galería. Bilan géochronologique. *L'Anthropologie* **105**:71-81.

Falguères, C. 2003. ESR dating and the human evolution: contribution to the chronology of the earliest humans in Europe. *Quaternary Science Reviews* **22**:1345-1351.

Farabagoli, E. 1996. "Romanina Bianca," in *Lettere di Pietra. I Depositi Pleistocenici: Sedimenti, Industrie e Faune del margine appenninico Bolognese*. Edited by F. Lenzi, G. Nenzioni, B. Costantini, and G. Onorevoli, pp. 56-61. Bologna: Editrice Compositori.

Farrand, W. R. 1995. "Geoarchaeology of Yarimburgaz Cave, Turkey," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermudez, J. L. Arsuaga, and E. Carbonell, pp. 19-36. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Féblot-Augustins, J. 1993. Mobility strategies in the late Middle Palaeolithic of Central Europe and Western Europe: elements of stability and variability. *Journal of Anthropological Archaeology* **12**:211-265.

Fernández Peris, J., Calatayud, M. G., and Martínez Valle, R. 1997. *Cova del Bolomor: los primeros habitantes de las tierras Valencianas*. Valencia: Museo de Prehistoria Servicio de Investigacion Prehistorica Centro Cultural de la Beneficencia.

Fernandez-Peris, J., and Villaverde, V. 1996. "The role and appraisal of quartzite and other non-flint lithic materials in the Lower and Middle Palaeolithic of Valencia," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula*. Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 125-130. Oxford: British Archaeological Reports International Series 649.

Fistani, A. B. 1993a. Découverte d'un humerus d'ursidé à l'olécrâne perforé dans le site de Gajtan 1 (Shkodër) en Albanie du Nord. *L'Anthropologie* **97**:223-238.

Fistani, A. B. 1993b. "Human Evolution in Albania for the Quaternary Period," in *Before the Wall Fell: The Science of Man in Socialist Europe*. Edited by R. A. Sigmon, pp. 141-178. Toronto: Canadian Scholars Press Inc.

Fleisch, H., and Sanlaville, P. 1974. La plage de +52m et son Acheuléen a Ras Beyrouth et a l'Ouadi Aabet (Liban). *Paléorient* **2**:45-85.

Fletcher, M., and Lock, G. R. 1991. *Digging Numbers. Elementary Statistics for Archaeologists*. Oxford: Oxford University Committee for Archaeology.

Foley, R. 1981. A Model of Regional Archaeological Structure. *Proceedings of the Prehistoric Society* **47**:1-17.

Foley, R. 1982. A reconsideration of the role of predation on large mammals in tropical hunter-gatherer adaptation. *Man* **17**:393-402.

Foley, R. 1984a. "Putting People into Perspective: an Introduction to Community Ecology," in *Hominid Evolution and Community Ecology: Prehistoric Human Adaptation in Biological Perspective*. Edited by R. Foley, pp. 1-24. London: Academic Press.

Foley, R. 1984b. "Early Man and the Red Queen: Tropical African Community Evolution and Hominid Adaptation," in *Hominid Evolution and Community Ecology: Prehistoric Human Adaptation in Biological Perspective*. Edited by R. Foley, pp. 85-110. London: Academic Press.

Foley, R. 1985. Optimality theory in Anthropology. *Man* **20**:222-242.

Foley, R. 1987a. Hominid species and stone-tool assemblages: how are they related? *Antiquity* **61**:380-392.

Foley, R. 1987b. *Another Unique Species: Patterns in human evolutionary ecology*. Harlow: Longman.

Foley, R. 1988. "Hominids, humans and hunter-gatherers: an evolutionary perspective," in *Hunter and Gatherers 1: History, evolution and social change*. Edited by T. Ingold, D. Riches, and J. Woodburn, pp. 207-221. Oxford: BERG.

Foley, R. 1989a. "The evolution of hominid social behaviour," in *Comparative Socioecology: The Behavioural Ecology of Humans and other Mammals*. Edited by V. Standen and R. A. Foley, pp. 473-494. Oxford: Blackwell.

Foley, R. 1989b. "The Ecological Conditions of Speciation: a Comparative Approach to the Origins of Anatomically-Modern Humans," in *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans*. Edited by P. Mellars and C. Stringer, pp. 298-318. Edinburgh: Edinburgh University Press.

Foley, R., and Lee, P. C. 1989. Finite Social Space, Evolutionary Pathways, and Reconstructing Hominid Behavior. *Science* **243**:901-906.

Foley, R. 1991. "How useful is the culture concept in early hominid studies?," in *The Origins of Human Behaviour*. Edited by R. A. Foley, pp. 25-38. London: Unwin Hyman.

Foley, R., and Lee, P. C. 1991. Ecology and energetics of encephalisation in hominid evolution. *Philosophical Transactions of the Royal Society of London Series B* **334**:223-232.

Foley, R. 1992. "Evolutionary Ecology of Fossil Hominids," in *Evolutionary Ecology and Human Behaviour*. Edited by E. A. Smith and B. Winterhalder, pp. 131-164. New York: Aldine de Gruyter.

Foley, R., and Lahr, M. M. 1992. Beyond out of Africa: reassessing the origins of Homo sapiens. *Journal of Human Evolution* **22**:523-529.

Foley, R. 1994. Speciation, extinction and climatic change in hominid evolution. *Journal of Human Evolution* **26**:275-289.

Foley, R. 1995a. *Humans before Humanity: An Evolutionary Perspective.* Oxford: Blackwell.

Foley, R. 1995b. "Language and thought in evolutionary perspective," in *Interpreting Archaeology: Finding meaning in the past.* Edited by I. Hodder, M. Shanks, A. Alexandri, V. Buchli, J. Carman, J. Last, and G. Lucas, pp. 76-80. London: Routledge.

Foley, R. 1996. An Evolutionary and Chronological Framework for Human Social Behaviour. *Proceedings of the British Academy* **88**:95-117.

Foley, R., and Lee, P. C. 1996. "Finite social space and the evolution of human social behaviour," in *The Archaeology of Human Ancestry: Power, Sex and Tradition.* Edited by J. Steele and S. Shennan, pp. 47-66. London: Routledge.

Foley, R., and Lahr, M. M. 1997. Mode 3 Technologies and the Evolution of Modern Humans. *Cambridge Archaeological Journal* 7:3-36.

Foley, R. 1998. The Context of Human Genetic Evolution. *Genome Research* **8**:339-347.

Fontana, F., Lenzi, F., Nenzioni, G., and Peretto, C. 1998. "Pebble Industries of the Appenine Foothills around Bologna," in *Proceedings of the XIII International Congress of Prehistoric and Protohistoric Sciences, Forli, Italia, 8/14 September 1996.* Edited by C. Peretto and C. Giunchi, pp. 957-968. Forli: A.B.A.C.O. Edizioni.

Fosse, G. 1982. Position stratigraphique et paléoenvironment du paléolithique ancien et moyen de Normandie. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **10-11**:83-92.

Fosse, P., and Bonifay, M.-F. 1991. "Les vestiges osseux de Soleilhac: approche taphonomique," in *Les Premiers Européens. Actes du Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 115-133. Paris: Editions du C.T.H.S.

Foulkes, M., and Newbold, K. B. 2000. Migration Propensities, Patterns, and the Role of Human Capital: Comparing Mexican, Cuban, and Puerto Rican Interstate Migration, 1985-1990. *Professional Geographer* **52**:133-145.

Fox, D. F., and Fox, B. J. 1986. "The Susceptibility of Natural Communities to Invasion," in *Ecology of Biological Invasions*. Edited by R. H. Groves and J. J. Burdon, pp. 57-66. Cambridge: Cambridge University Press.

Freeman, L. G., and Butzer, K. W. 1966. The Acheulean Station of Torralba (Spain): A Progress Report. *Quaternaria* **8**:9-21.

Fridrich, J. 1976. "The first industries from Eastern and South-Eastern Central Europe," in *Les Premieres Industries de l'Europe*. Edited by K. Valoch, pp. 8-23. Brno: Moravian Museum.

Fridrich, J. 1989. *Prezletice: A Lower Palaeolithic Site in Central Bohemia (Excavations 1969-1985)*. Prague: Museum National Pragae.

Fridrich, J. 1991a. The oldest Palaeolithic stone industry from the Beroun highway complex. *Antropozoikum* **20**:111-128.

Fridrich, J. 1991b. "Les premiers peuplements humains en Bohême (Tchécoslavaquie)," in *Les Premiers Européens: Actes du 114e Congrès national des sociétés savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 195-201. Paris: Editions du C.T.H.S.

Frye, N. J. 1957. *Anatomy of Criticism: Four Essays*. Princeton: Princeton University Press.

Fuentes, E. R. 1991. "Central Chile: how do introduced plants and animals fit into the landscape?," in *Biogeography of Mediterranean Invasions*. Edited by R. H. Groves and F. di Castri, pp. 43-49. Cambridge: Cambridge University Press.

Gabounia, L., de Lumley, M.-A., Vekua, A., Lordkipanidze, D., and de Lumley, H. 2002. Découverte d'un nouvel hominidé à Dmanissi (Transcaucasie, Géorgie). *C. R. Palevol* **1**:243-253.

Gabunia, L., Vekua, A., Lordkipanidze, D., Ferring, R., Justus, A., Maisuradze, G., Mouskhelishvili, A., Nioradze, M., Sologashvili, D., Swisher, C. C., and Tvalchrelidze, M. 2000. "Current research on the Hominid Site of Dmanisi," in *Early Humans at the Gates of Europe.*, 92 edition, *ERAUL*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 13-27. Liege: University of Liege.

Gabunia, M. 2000. "On Ancient Man in the volcanic Mountainous Region of South Georgia," in *Early Humans at the Gates of Europe: Proceedings of the first international symposium Dmanisi, Tbilisi (Georgia) September 1998*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 43-47. Liege: University of Liege ERAUL 92.

Galiberti, A. 1982. L'industria di tipo Pebble Culture di Bibbona (Livorno) (Nota preliminare). *Atti della XXIII Riunione Scientifica dell'Instituto Italiano di Preistoria e Protostoria*:463-479.

Galiberti, A., and Calboli, G. 1992. "Scoperta di un'industria su ciottolo nel Gargano settentrionale (Puglia): Nota preliminare," in *Il Più Antico Popolamento della Valle Padana nel quadro delle conoscenze Europee: Monte Poggiolo*. Edited by C. Peretto, pp. 109-127. Milan: Jaca Books.

Gambassini, P., and Ronchitelli, A. M. 1982. L'industria arcaica su ciottolo di Casella di Maida (Catanzaro). *Rivista di Scienze Preistoriche* **37**:3-30.

Gambassini, P. 1997. *Il Paleolitico di Castelcivita: culture e ambiente*. Napoli: Electa.

Gamble, C. 1980. Information exchange in the Palaeolithic. *Nature* **283**:522-523.

Gamble, C. 1982. Interaction and alliance in Palaeolithic society. *Man* **17**:92-107.

Gamble, C. 1983. "Culture and society in the Upper Palaeolithic of Europe," in *Hunter-Gatherer Economy in Prehistory: A European Perspective*. Edited by G. Bailey, pp. 201-211. Cambridge: Cambridge University Press.

Gamble, C. 1984. "Regional Variation in Hunter-Gatherer Strategy in the Upper Pleistocene of Europe," in *Hominid Evolution and Community Ecology: prehistoric human adaptation in biological perspective*. Edited by R. Foley, pp. 237-260. London: Academic Press.

Gamble, C. 1986. *The Palaeolithic Settlement of Europe*. Cambridge: Cambridge University Press.

Gamble, C. 1987. "Man the Shoveler: Alternative Models for Middle Pleistocene Colonization and Occupation in Northern Latitudes," in *The Pleistocene Old World: Regional Perspectives*. Edited by O. Soffer, pp. 81-98. New York: Plenum Press.

Gamble, C. 1993a. "Exchange, Foraging and Local Hominid Networks," in *Trade and Exchange in prehistoric Europe: proceedings of a conference held at the University of Bristol, April 1992*. Edited by C. Scarre and F. Healy, pp. 35-44. Oxford: Oxbow Books.

Gamble, C. 1993b. *Timewalkers: The Prehistory of Global Colonization*. Cambridge, Massachusetts: Harvard University Press.

Gamble, C. 1995a. "Raw materials, technology and variability in Middle Pleistocene Europe," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermúdez, J. L. Arsuaga, and E. Carbonell, pp. 387-402. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Gamble, C. 1995b. "Lithics and Social Evolution," in *Lithics in Context: Suggestions for the future direction of Lithic Studies*. Edited by A. J. Schofield, pp. 19-26: Lithic Studies Society Occasional Paper No. 5.

Gamble, C. 1995c. "The earliest occupation of Europe: the environmental background," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France) 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 279-295. Leiden: University of Leiden Press.

Gamble, C. 1996a. "Making Tracks: Hominid networks and the evolution of the social landscape," in *The Archaeology of Human Ancestry: Power, Sex and Tradition*. Edited by J. Steele and S. J. Shennan, pp. 253-277. London: Routledge.

Gamble, C. 1996b. "Hominid Behaviour in the Middle Pleistocene: an English Perspective," in *The English Palaeolithic Reviewed: papers from a day conference held at the Society of Antiquaries of London, 28 October 1994*. Edited by C. Gamble and A. J. Lawson, pp. 63-72. Salisbury: Trust for Wessex Archaeology.

Gamble, C. 1997. The Skills of the Lower Palaeolithic World. *Proceedings of the Prehistoric Society* **63**:407-410.

Gamble, C. 1998a. Palaeolithic society and the release from proximity: a network approach to intimate relations. *World Archaeology* **29**:426-449.

Gamble, C. 1998b. "Concluding remarks: archaeology's fifth big question," in *Early Human Behaviour in Global Context: The Rise and Diversity of the Lower Palaeolithic Record.* Edited by M. D. Petraglia and R. Korisettar, pp. 451-468. London: Routledge.

Gamble, C. 1999. *The Palaeolithic Societies of Europe*. Cambridge: Cambridge University Press.

Gamble, C., and Roebroeks, W. 1999. "The Middle Palaeolithic: a point of inflection," in *The Middle Palaeolithic Occupation of Europe*. Edited by W. Roebroeks and C. Gamble, pp. 3-21. Leiden: University of Leiden Press.

Gamble, C., and Steele, J. 1999. "Hominid Ranging Patterns and Dietary Strategies," in *Hominid Evolution: Lifestyles and Survival Strategies*. Edited by H. Ullrich, pp. 396-409. Gelsenkirchen: Edition Archaea.

Gamble, C. 2000. "The Maxwell Nine and the peopling of Southwest Tasmania," in *Australian Archaeologist: Collected papers in honour of Jim Allen*. Edited by A. Anderson and T. Murray, pp. 122-130: Coombs Academic Publishing.

Gamble, C. 2001. Modes, movement and moderns. *Quaternary International* **75**:5-10.

Gamble, C. S., and ApSimon, A. M. 1986. "Red Barns-Portchester," in *The Palaeolithic of Britain and its Nearest Neighbours: Recent Trends*. Edited by S. N. Collcutt, pp. 8-12. Sheffield: University of Sheffield.

Gamble, C. S. 1995d. "The earliest occupation of Europe: the environmental background," in *The Earliest Occupation of Europe*. Edited by T. van Kolfschoten, pp. 279-295. Leiden: University of Leiden Press.

Garcea, E. A. A. 2004. Crossing deserts and avoiding seas: Aterian North African-European relations. *Journal of Anthropological Research* **60**:27-53.

García Antón, M. 1995. "Pollen analysis of Middle Pleistocene palaeovegetation at Atapuerca," in *Human Evolution in Europe and the Atapuerca Evidence.* Edited by J. M. Bermudez, J. L. Arsuaga, and E. Carbonell, pp. 147-165. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Garcia, N., Arsuaga, J. L., and Torres, T. 1997. The carnivore remains from the Sima de los Huesos Middle Pleistocene site (Sierra de Atapuerca, Spain). *Journal of Human Evolution* **33**:155-174.

Garcia, N., and Arsuaga, J. L. 1999. Carnivores from the Early Pleistocene hominid-bearing Trinchera Dolina 6 (Sierra de Atapuerca, Spain). *Journal of Human Evolution* **37**:415-430.

Gaudzinski, S., and Vollbrecht, J. 1995. "Kärlich," in *Quaternary field trips in Central Europe vol.2.* Edited by W. Schirmer, pp. 885-891. Munich: Verlag Dr. Friedrich Pfeil.

Gaudzinski, S., Bittmann, F., Boenigk, W., Frechen, M., and van Kolfschoten, T. 1996. Palaeoecology and Archaeology of the Kärlich-Seeufer Open-Air Site (Middle Pleistocene) in the Central Rhineland, Germany. *Quaternary Research* **46**:319-334.

Gaudzinski, S., Bittmann, F., and Leuschner, H.-H. 1998. Kärlich-Seeufer: Untersuchungen zu einer altpaläolithiscen Fundstelle im Neuwieder Becken (Rheinland-Pfalz). *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* **43**:3-239.

Geneste, J.-M., Texier, J.-P., and Rigaud, J.-P. 1991. "Les plus anciens vestiges de la présence humaine en Aquitaine," in *Les Premiers Européens. Actes du 114e Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989).* Edited by E. Bonifay and B. Vandermeersch, pp. 11-26. Paris: Editions du C.T.H.S.

Geraads, D., Hublin, J.-J., Jaeger, J.-J., Tong, H., Sen, S., and Toubeau, P. 1986. The Pleistocene Hominid Site of Ternifine, Algeria: New Results on the Environment, Age, and Human Industries. *Quaternary Research* **25**:380-386.

Geraads, D. 1994. Rongeurs et Lagomorphes du Pleistocène moyen de la Grotte des Rhinocéros, Carrière Oulad Hamida 1 à Casablanca, Maroc. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen* **191**:147-172.

Gese, E. M., Ruff, R. L., and Crabtree, R. L. 1996. Social and nutritional factors influencing the dispersal of resident coyotes. *Animal Behaviour* **52**:1025-1043.

Gibbard, P. L., and Wymer, J. J. 1983. "Highlands Farm," in *The Diversion of the Thames. Field Guide*. Edited by P. L. Gibbard, D. A. Cheshire, and J. Rose, pp. 69-76. Leighton Buzzard: Quaternary Research Association.

Gibert, J., Iglesias, A., Maillo, A., and Gibert, L. 1992. "Industrias líticas en el Pleistoceno inferior de la región de Orce," in *Presencia humana en el Pleistoceno inferior de Granada y Murcia, Proyecto Orce-Cueva Victoria (1988-1992)*. Edited by J. Gibert, pp. 219-281. Granada: Ayuntamiento de Orce.

Gibert, J., Ribot, F., Gibert, L., Leakey, M., Arribas, A., and Martinez, B. 1995. Presence of the Cercopithecid genus Theropithecus in Cueva Victoria (Murcia, Spain). *Journal of Human Evolution* **28**:487-493.

Gibert, J., Gibert, L., Iglesias, A., and Maestro, E. 1998. Two Oldowan assemblages in the Plio-Pleistocene deposits of the Orce region, southeast Spain. *Antiquity* **72**:17-25.

Gibert, J., Gibert, L., Ferràndez-Canyadell, C., Iglesias, A., and González, F. 2001. "Venta Micena, Barranco León-5 and Fuentenueva-3: three archaeological sites in the Early Pleistocene deposits of Orce, south-east Spain," in *A Very*

Remote Period Indeed: Papers on the Palaeolithic Presented to Derek Roe. Edited by S. Milliken and J. Cook, pp. 144-152. Oxford: Oxbow Books.

Gilbert, W. H., White, T. D., and Asfaw, B. 2003. Homo erectus, Homo ergaster, Homo cepranensis, and the Daka cranium. *Journal of Human Evolution* **45**:255-259.

Gilead, D., and Israel, M. 1975. An Early Palaeolithic site at Kefar Menahem: Preliminary report. *Tel Aviv* **2**:1-12.

Gilead, I., and Ronen, A. 1977. Acheulean industries from Evron on the Western Galilee Coastal Plain. *Eretz-Israel* **13**:56-86.

Gilead, I. 1981. "Upper Palaeolithic tool assemblages from the Negev and Sinai," in *Préhistoire du Levant: Chronologie et organisation de l'espace depuis les origines jusqu'au VIe millénaire*. Edited by J. Cauvin and P. Sanlaville, pp. 331-342. Paris: Centre National de la Recherche Scientifique.

Giles Pacheco, F., and Pérez, A. S. 1987. "El poblamiento del sur de la península Ibérica en el Pleistoceno inferior a través de Gibraltar," in *Actas del Congreso Internacional El estrecho de Gibraltar Ceuta 1987, Tomo 1 Prehistoria e Historia de la Antigüedad*, pp. 97-109. Madrid: Universidad nacional de educacion a distancia.

Giles Pacheco, F., Santiago Perez, A., Gutierrez Lopez, J. M., Mata Almonte, E., and Aguilera Rodriguez, L. 1993. "El Paleolitico Inferior de la Laguna de Medina (Jerez de la Frontera, Cadiz)," in *El Cuaternario en España y Portugal 1*. Edited by I.T.G.M. and A.E.Q.U.A., pp. 463-473. Madrid.

Giles Pacheco, F., Gutierrez Lopez, J. M., Mata Almonte, E., and Santiago Perez, A. 1996. Laguna de Medina, bassin du fleuve Guadalete (Cadiz, Espagne), un gisement acheuléen ancien dans le cadre des premières occupations humaines de la péninule Ibérique. *L'Anthropologie* **100**:507-528.

Ginat, H., Zilberman, E., and Saragusti, I. 2003. Early Pleistocene lake deposits and Lower Paleolithic finds in Nahal (wadi) Zihor, Southern Negev desert, Israel. *Quaternary Research* **59**:445-458.

Ginter, B., Kozlowski, J. K., Laville, H., Sirakov, N., and Hedges, R. E. M. 1996. "Transition in the Balkans: News from the Temnata Cave, Bulgaria," in *The Last Neanderthals, The First Anatomically Modern Humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40Ka BP.* Edited by E. Carbonell and M. Vaquero, pp. 169-200: Grafiques Lluc.

Girard, M. 1976. "La végétation au Pléistocène moyen dans les Pyrénées," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 489-490. Paris: Centre National de la Recherche Scientifique.

Giusberti, G., and Peretto, C. 1991. Évidences de la fracturation intentionnelle d'ossements animaux avec moelle dans le gisement de La Pineta de Isernia (Molise), Italie. *L'Anthropologie* **95**:765-778.

Gladilin, V. N. 1989. The Korolevo Palaeolithic Site: research methods, stratigraphy. *Anthropologie (Brno)* **27**:93-103.

Gonzalez Echegaray, J., and Freeman, L. G. 1978. *Vida y Muerte en Cueva Morin.* Santander: Coleccion de Bolsillo.

Gonzalez Echegaray, J. 1980. *El Yacimiento de la Cueva de <<El Pendo>> (Excavaciones 1953 - 57).* Madrid: Instituto Espanol de Prehistoria.

Goren-Inbar, N., Lister, A., Werker, E., and Chech, M. 1994. A Butchered Elephant Skull and associated artifacts from the Acheulean Site of Gesher Benot Ya'aqov, Israel. *Paléorient* **20**:99-112.

Goren-Inbar, N. 2000. "The Gesher Benot Ya'aqov Acheulean site- Additional Evidence for the Out of Africa Behavioural Model," in *Early Humans at the Gates of Europe*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 157. Liege: University of Liege.

Goren-Inbar, N., Feibel, C. S., Verosub, K. L., Melamed, Y., Kislev, M. E., Tchernov, E., and Saragusti, I. 2000. Pleistocene Milestones on the Out-of-Africa Corridor at Gesher Benot Ya'aqov, Israel. *Science* **289**:944-947.

Gowlett, J. A. J., and Hallos, J. 2000. "Beeches Pit: overview of the archaeology," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 197-206. London: Quaternary Research Association.

Grevstad, F. S. 1999. Experimental invasions using biological control introductions: the influence of release size on the chance of population establishment. *Biological Invasions* **1**:313-323.

Grieco, E. M. 1998. The Effects of Migration on the Establishment of Networks: Caste Disintegration and Reformation Among the Indians of Fiji. *International Migration Review* **32**:704-736.

Grinnell, J. 1922. The role of the "accidental". *Auk* **39**:373-380.

Grün, R. 1996. A re-analysis of electron spin resonance dating results associated with the Petralona hominid. *Journal of Human Evolution* **30**:227-241.

Guadelli, J.-L., and Delpech, F. 1992. "Les Grands Mammifères du début du paléolithique supérieur à Temnata," in *Temnata Cave: Excavations in Karlukovo Karst Area, Bulgaria, volume 2, part 1*. Edited by B. Ginter, J. K. Kozlowski, J.-L. Guadelli, and H. Laville, pp. 53-158. Krakow: Jagellonian University Press.

Guérin, C., Dewolf, Y., and Lautridou, J.-P. 2003. Révision d'un site paléontologique célèbre: Saint-Prest (Chartres, France). *Geobios* **36**:55-82.

Guichard, G. 1976. "Les civilisations du Paléolithique inférieur en Périgord," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 909-928. Paris: Centre National de la Recherche Scientifique.

Güleç, E., Clark Howell, F., and White, T. D. 1999. "Dursunlu: A New Lower Pleistocene Faunal and Artifact-bearing Locality in Southern Anatolia," in *Hominid Evolution: Lifestyles and Survival Strategies*. Edited by H. Ullrich, pp. 349-364. Gelsenkirchen: Edition Archaea.

Gusi, F., Carbonell, E., and Estevez, J. 1982. "El jaciment del pleistocè mitjà del Cau d'en Borràs (Orpesa-Castelló," in *Estat actual de la recerca arqueológica a l'Istme Pirinenc. Homenatge al Dr. Miquel Oliva Prat. 4 Colloqui Internacional d'arqueología de Puigcerdà, 23-25 d'Octubre de 1980*. Edited by M. Tarradell and J. Padró, pp. 19-23. Puigcerdà: Institut d'Estudis Ceretans.

Guth, C. 1974. Découverte dans le Villafranchien d'Auvergne de galets aménagés. *Comptes Rendus de l'Academie de Sciences de Paris serie D* **279**:1071-1072.

Guthrie, R. D. 1990. *Frozen Fauna of the Mammoth Steppe: the Story of Blue Babe*. London: University of Chicago Press.

Haberkorn, G. 1981. "The Migration Decision Making Process: Some Social-Psychological Considerations," in *Migration Decision Making: Multidisciplinary Approaches to Microlevel Studies in Developed and Developing Countries*. Edited by G. F. de Jong and R. W. Gardner, pp. 252-278. New York: Pergamon Press.

Haesaerts, P., Damblon, F., Bachner, M., and Trnka, G. 1996. Revised stratigraphy and chronology of the Willendorf II sequence, Lower Austria. 80, 25-42. *Archaeologia Austriaca* **80**:25-42.

Hahn, J. 1970. Recherches sur l'Aurignacien en Europe centrale et orientale. *L'Anthropologie* **74**:195-219.

Hahn, J. 1971. La statuette masculine de la grotte du Hohlenstein-Stadel (Wurtemberg). *L'Anthropologie* **75**:233-243.

Hahn, J. 1977. *Aurignacien: das Ältere Jungpaläolithikum in Mittel- und Osteuropa; Fundamenta vol. 9.* Koln: Bohlau Verlag.

Hahn, J. 1988. *Die Geissenklösterle-Höhle im Achtal bei Blaubeuren I.* Stuttgart: Konrad Theiss Verlag.

Hahn, J. 1989. *Genese und Funktion einer jungpaläolithischen Freilandstation: Lommersum im Rheinland. Rheinische Ausgrabungen, Band 29.* Koln: Rheinland-Verlag GMBH.

Haileab, B., and Brown, F. 1994. Tephra correlations between the Gadeb prehistoric site and the Turkana Basin. *Journal of Human Evolution* **26**:167-173.

Hallegouet, B., Hinguant, S., Gebhardt, A., and Monnier, J.-L. 1992. Le gisement Paléolithique inférieur de Ménez-Drégan 1 (Plouhinec, Finistère). Premiers résultats des fouilles. *Bulletin de la Société Préhistorique Française* **89**:77-81.

Hamerow, H. 1997. "Migration Theory and the Anglo-Saxon Identity Crisis," in *Migrations and Invasions in Archaeological Explanation.* Edited by J. Chapman and H. Hamerow, pp. 33-44. Oxford: British Archaeological Reports International Series 664.

Hanski, I. 1991. Single-species metapopulation dynamics: concepts, models and observations. *Biological Journal of the Linnean Society* **42**:17-38.

Hanski, I., and Gilpin, M. 1991. Metapopulation dynamics: brief history and conceptual domain. *Biological Journal of the Linnean Society* **42**:3-16.

Hansson, L. 1991. Dispersal and connectivity in metapopulations. *Biological Journal of the Linnean Society* **42**:89-103.

Harbison, S. F. 1981. "Family Structure and Family Strategy in Migration Decision Making," in *Migration Decision Making: Multidisciplinary Approaches to Microlevel Studies in Developed and Developing Countries*. Edited by G. F. de Jong and R. W. Gardner, pp. 225-251. New York: Pergamon Press.

Harcourt, A. H. 2000. Latitude and latitudinal extent: a global analysis of the Rapoport effect in a tropical mammalian taxon: primates. *Journal of Biogeography* **27**:1169-1182.

Hardaker, T. 2001. "New Lower Palaeolithic finds from the Upper Thames," in *A Very Remote Period Indeed: Papers on the Palaeolithic presented to Derek Roe*. Edited by S. Milliken and J. Cook, pp. 180-198. Oxford: Oxbow Books.

Hazelwood, L., and Steele, J. 2003. "Colonizing new landscapes: archaeological detectability of the first phase," in *Colonization of Unfamiliar Landscapes: The archaeology of adaptation*. Edited by M. Rockman and J. Steele, pp. 203-221. London: Routledge.

Hazelwood, L., and Steele, J. 2004. Spatial dynamics of human dispersals. Constraints on modelling and archaeological validation. *Journal of Archaeological Science* **31**:669-679.

Heaney, L. R. 1986. Biogeography of mammals in SE Asia: estimates of rates of colonization, extinction and speciation. *Biological Journal of the Linnean Society* **28**:127-165.

Hengeveld, R. 1989. *Dynamics of Biological Invasions*. London: Chapman and Hall.

Henzi, S. P., Lycett, J. E., and Piper, S. E. 1997. Fission and troop size in a mountain baboon population. *Animal Behaviour* **53**:525-535.

Hoffecker, J. F., Baryshnikov, G. F., and Doronichev, V. B. 2003. Large mammal taphonomy of the Middle Pleistocene hominid occupation at Treugol'naya Cave (Northern Caucasus). *Quaternary Science Reviews* **22**:595-607.

Hoffman, A. A., and Blows, M. W. 1994. Species borders: ecological and evolutionary perspectives. *Trends in Ecology and Evolution* **9**:223-227.

Hohmann, G., and Fruth, B. 2003. Culture in Bonobos? Between-Species and Within-Species Variation in Behavior. *Current Anthropology* **44**:563-571.

Holm, J. 1986. "The Quaternary and the Early/Middle Palaeolithic of Denmark," in *Chronostratigraphie et faciès culturels du Paléolithique inférieur et moyen dans l'Europe du Nord-Ouest.* Edited by A. Tuffreau and J. Sommé, pp. 75-80. Paris: Société Préhistorique Française et l'Association Française pour l'Etude du Quaternaire.

Honea, K. 1986. "Dating and Periodization Strategies of the Romanian Middle and Upper Palaeolithic: A Retrospective Overview and Assessment," in *The Pleistocene Perspective. Volume 1. The World Archaeological Congress, 1-7th September 1986.* London: Allen and Unwin.

Horowitz, A. 1989. "Prehistoric cultures of Israel: Correlation with the oxygen isotope scale," in *Investigations in South Levantine Prehistory.* Edited by O. Bar-Yosef and B. Vandermeersch, pp. 5-17. Oxford: British Archaeological Reports International Series 497.

Horwitz, L. K., and Tchernov, E. 1989. The Late Acheulean Fauna from Oumm Zinat. *Mitekufat Haeven* **22**:7-14.

Hours, F., and Sanlaville, P. 1972. Découverte de silex taillés dans une plage située à +95m à Borj Qinnarit (Liban). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **275**:2219-2221.

Hours, F. 1975. "The Lower Paleolithic of Lebanon and Syria," in *Problems in Prehistory: North Africa and the Levant*. Edited by F. Wendorf and A. E. Marks, pp. 249-271. Dallas: SMU Press.

Hours, F., Le Tensorer, J. M., Muhesen, S., and Yalçinkaya, I. 1983. Premiers Travaux sur le site Acheuléen de Nadaouiyeh 1 (El Kowm, Syrie). *Paléorient* **9**:5-13.

Housley, R. A., Gamble, C. S., Street, M., and Pettitt, P. 1997. Radiocarbon evidence for the Lateglacial Human Recolonisation of Northern Europe. *Proceedings of the Prehistoric Society* **63**:25-54.

Hugo, G. J. 1981. "Village-Community Ties, Village Norms, and Ethnic and Social Networks: A Review of the Evidence from the Third World," in *Migration Decision Making: Multidisciplinay Aproaches to Microlevel Studies in Developed and Developing Countries*. Edited by G. F. de Jong and R. W. Gardner, pp. 186-224. New York: Pergamon Press.

Huntley, B., Alfano, M. J., Allen, J. R. M., Pollard, D., Tzedakis, P. C., de Beaulieu, J.-L., Gruger, E., and Watts, B. 2003. European vegetation during Marine Oxygen Isotope Stage-3. *Quaternary Research* **59**:195-212.

Huntley, B., and Allen, J. R. M. 2003. "Glacial Environments III: Palaeo-vegetation Patterns in Late Glacial Europe," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 79-102. Cambridge: McDonald Institute for Archaeological Research.

Iturbe, G., and Cortell, E. 1987. Las dataciones de Cova Beneito y su interes para el paleolitico mediterraneo. *Trabajos de Prehistoria* **44**:267-270.

Jacobi, R. M., Rowe, P. J., Gilmour, M. A., Grun, R., and Atkinson, T. C. 1998. Radiometric dating of the Middle Palaeolithic tool industry and associated fauna of Pin Hole Cave, Creswell Crags, England. Journal of Quaternary Science 13, 29-42. *Journal of Quaternary Science* **13**:29-42.

Jacobi, R. M., and Pettitt, P. B. 2000. An Aurignacian point from Uphill Quarry (Somerset) and the earliest settlement of Britain by Homo sapiens sapiens. Antiquity 74, 513-8. *Antiquity* **74**:513-518.

Jaeger, J.-J. 1975. "The Mammalian Faunas and Hominid Fossils of the Middle Pleistocene of the Maghreb," in *After the Australopithecines: Stratigraphy, Ecology, and Culture Change in the Middle Pleistocene*. Edited by K. W. Butzer and G. L. Isaac, pp. 399-418. The Hague: Mouton.

Jaksic, F. M., and Fuentes, E. R. 1991. "Ecology of a successful invader: the European rabbit in central Chile," in *Biogeography of Mediterranean Invasions*. Edited by R. H. Groves and F. di Castri, pp. 273-283. Cambridge: Cambridge University Press.

Jelinek, A. 1990. "The Amudian in the Context of the Mugharan Tradition at the Tabun Cave (Mount Carmel), Israel," in *The Emergence of Modern Humans: An Archaeological Perspective*. Edited by P. Mellars, pp. 81-90. Edinburgh: Edinburgh University Press.

Jelinek, A. J. 1982. "The Middle Palaeolithic in the Southern Levant, with comments on the appearance of modern Homo sapiens," in *The Transition from Lower to Middle Palaeolithic and the Origin of Modern Man*. Edited by A. Ronen, pp. 57-104. Oxford: British Archaeological Reports International Series 151.

Jequier, J.-P. 1975. *Le Moustérien Alpin. Révision critique.* Yverdon: Institut d'Archéologie Yverdonnoise.

Jones, S. 1997. *The Archaeology of Ethnicity: Constructing identities in the past and present.* London: Routledge.

Joyes, R. 1996. Découverte d'outils du paléolithique inférieur antérieurs à la limite Matuyama-Brunhes associés aux travertins du Plateau de France, Millau (Aveyron). *L'Anthropologie* **100**:226-235.

Junkmanns, J. 1995. Les ensembles lithiques d'Achenheim d'après la collection de Paul Wernert. *Bulletin de la Société Préhistorique Française* **92**:26-36.

Karavanic, I. 1995. Upper Paleolithic occupation levels and late-occurring Neandertal at Vindija Cave (Croatia) in the context of Central Europe and the Balkans. *Journal of Anthropological Research* **51**:9-35.

Karavanic, I. 2000. "Olschewian and appearance of bone technology in Croatia and Slovenia," in *Neanderthals and Modern Humans- Discussing the Transition: Central and Eastern Europe from 50.000-30.000 B.P.* Edited by J. Orschiedt and G.-C. Weniger, pp. 159-168. Mettmann: Neanderthal Museum.

Karkanas, P., Bar-Yosef, O., Goldberg, P., and Weiner, S. 2000. Diagenesis in Prehistoric Caves: the Use of Minerals that Form In Situ to Assess the Completeness of the Archaeological Record. *Journal of Archaeological Science* **27**:915-929.

Kearney, M. 1986. From the invisible hand to visible feet: Anthropological Studies of Migration and Development. *Annual Review of Anthropology* **15**:331-361.

Kelly, R. L. 2003. "Colonization of new land by hunter-gatherers: expectations and implications based on ethnographic data," in *Colonization of Unfamiliar*

Landscapes: The archaeology of adaptation. Edited by M. Rockman and J. Steele, pp. 44-58. London: Routledge.

Key, C. A. 2000. The evolution of human life history. *World Archaeology* **31**:329-350.

Klein, R. G. 1998. "Why anatomically modern people did not disperse from Africa 100,000 years ago," in *Neanderthals and Modern Humans in Western Asia*. Edited by T. Akazawa, T. Aoki, and O. Bar-Yosef, pp. 509-521. New York: Plenum Press.

Kourtessi-Philippakis, G. 1993. "Les plus anciennes occupations humaines dans le territoire Épirote et aux confins de l'Illyrie méridionale," in *L'Illyrie méridionale et l'Épire dans l'Antiquité II. Actes du IIe colloque internationale de Clermond-Ferrand (25-27 Octobre 1990)*. Edited by P. Cabanes, pp. 10-16. Paris: De Boccard.

Kozlowski, J. K. 1982. *Excavation in the Bacho Kiro Cave (Bulgaria). Final Report.* Warsaw: Panstwowe Wydawnictwo Naukowe.

Kozlowski, J. K., Laville, H., and Sirakov, N. 1982. *Temnata Cave: Excavations in Karlukovo Karst Area, Bulgaria*. Cracow: Jagellonian University Press.

Kozlowski, J. K. 1992. The Balkans in the Middle and Upper Palaeolithic: The Gate to Europe, or a Cul-de-Sac? *Proceedings of the Prehistoric Society* **58**:1-20.

Kozlowski, J. K., Laville, H., and Sirakov, N. 1992. *Temnata Cave: Excavations in Karlukovo Karst Area, Bulgaria*. Cracow: Jagellonian University Press.

Kozlowski, J. K. 1993. "L'Aurignacien en Europe et au Proche Orient," in *Aurignacien en Europe et au Proche Orient*. Edited by L. Bánesz and J. K. Kozlowski, pp. 283-291. Bratislava: Acts of the 12th International Congress of Prehistoric and Protohistoric Sciences.

Kozlowski, J. K. 2000. "Southern Poland between 50 and 30 KYR B.P., environment and archaeology," in *Neanderthals and Modern Humans- Discussing the Transition: Central and Eastern Europe from 50.000-30.000 B.P.* Edited by J. Orschiedt and G.-C. Weniger, pp. 76-91. Mettmann: Neanderthal Museum.

Kozlowski, J. K. 2001. Origin and evolution of blade technologies in the Middle and early Upper Palaeolithic. *Mediterranean Archaeology and Archaeometry* **1**:3-18.

Kretzoi, M., and Vertes, L. 1965. Upper Biharian (Intermindel) Pebble-industry Occupation Site in Western Hungary. *Current Anthropology* **6**:74-87.

Kretzoi, M., and Dobosi, V. T. 1990. *Vértesszölös: Man, Site and Culture*. Budapest: Akadémiai Kiadó.

Kuhn, S. L. 1995. *Mousterian Lithic Technology: An Ecological Perspective*. Princeton: Princeton University Press.

Kuhn, S. L., Arsebük, G., and Clark Howell, F. 1996. The Middle Pleistocene lithic assemblage from Yarimburgaz Cave, Turkey. *Paléorient* **22**:31-49.

Kuhn, S. L., Stiner, M. C., and Clark Howell, F. 1998. "Middle Pleistocene Hominids and Bears at Yarimburgaz Cave (Thrace, Turkey)," in *Préhistoire d'Anatolie, Genèse des deux mondes: Actes du colloque international Liège, 28 avril- 3 mai 1997*. Edited by M. Otte, pp. 579-598. Liege: University of Liege ERAUL 85.

Kuhn, S. L., Stiner, M. C., and Güleç, E. 1999. Initial Upper Palaeolithic in south-central Turkey and its regional context: a preliminary report. *Antiquity* **73**:505-517.

Kuhn, S. L., Stiner, M. C., Reese, D. S., and Gulec, E. 2001. Ornaments of the earliest Upper Paleolithic: New insights from the Levant. *Proceedings of the National Academy of Sciences of the USA* **98**:7641-7646.

Kuhn, T. S. 1962. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Kulemeyer, J. 1988. Die alt- und mittelpaläolithischen Funde von Kärlich. Unpublished Ph.D Thesis, University of Koln.

Lahr, M. M., and Foley, R. A. 1994. Multiple dispersals and modern human origins. *Evolutionary Anthropology* **3**:48-60.

Lahr, M. M., and Foley, R. A. 1998. Towards a Theory of Modern Human Origins: Geography, Demography, and Diversity in Recent Human Evolution. *Yearbook of Physical Anthropology* **41**:137-176.

Lahr, M. M., and Foley, R. A. 2003. "Demography, Dispersal and Human Evolution in the Last Glacial Period," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 241-256. Cambridge: McDonald Institute for Archaeological Research.

Lamotte, A. 2001. *Les industries à bifaces de l'Europe du Nord-Ouest au Pléistocène moyen. L'apport des données des gisements du bassin de la Somme, de l'Escaut et de la Baie de St-Brieuc*. Oxford: British Archaeological Reports International Series 932.

Langbroek, M., and Roebroeks, W. 2000. Extraterrestrial evidence on the age of the hominids from Java. *Journal of Human Evolution* **38**:595-600.

Laville, H. 1975. *Climatologie et chronologie du Paléolithique en Périgord. Étude sédimentologique de dépôts en grottes et sous abris*. Marseille: Editions du laboratoire de paléontologie humaine et de préhistoire.

Le Tensorer, J. M., Muhesen, S., and Jagher, R. 1993. "Nadaouiyeh 1 Aïn Askar: une grande séquence paléolithique du bassin d'El Kowm (Syrie), premiers résultats, fouilles 1989-1992," in *Cahiers de l'Euphrate 7*. Edited by J. Cauvin, pp. 11-36. Paris: Editions Recherche sur les Civilisations.

Lécolle, F. 1982. Contexte Géologique de la Grotte de l'Aldène (Cesseras, Hérault, France): Origine possible des matières premières de l'industrie lithique. *Bulletin du Musée d'Anthropologie Préhistorique de Monaco* **26**:31-40.

Leroi-Gourhan, A., and Leroi-Gourhan, A. 1964. Chronologie des grottes d'Arcy-sur-Cure (Yonne). *Gallia Préhistoire* 7:1-64.

Leroi-Gourhan, A. 1968. L'Abri du Facteur à Tursac (Dordogne). Analyse pollinique. *Gallia Préhistoire* **11**:123-132.

Leroi-Gourhan, A. 1976. "Arcy-sur-Cure (Yonne). Les grottes de la Cure," in *Union Internationale des Sciences Préhistoriques et Protohistoriques Livret-Guide de l'excursion A1: Sud du bassin Parisien*. Edited by A. Leroi-Gourhan, J. Allain, and M. Brézillon, pp. 122-136. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Leroi-Gourhan, A. 1984. La place du Néanderthalien de St.-Césaire dans la chronologie würmienne. *Bulletin de la Société Préhistorique Française* **81**:196-198.

Lévêque, F., and Vandermeersch, B. 1980. Découverte de restes humains dans un niveau castelperronien à Saint-Césaire (Charente-Maritime). *Comptes Rendus de l'Academie de Sciences de Paris serie D* **291**:187-189.

Lévêque, F., and Miskovsky, J.-C. 1983. Le Castelperronien dans son environnement géologique. Essai de synthèse à partir de l'étude lithostratigraphique du remplissage de la grotte de la Grande Roche de la Plématrie (Quinçay, Vienne) et d'autres dépôts actuellement mis au jour. *L'Anthropologie* **87**:369-391.

Lévêque, F., Backer, A. M., and Guilbaud, M. 1993. *Context of a Late Neanderthal: Implications of Multidisciplinary Research for the Transition to Upper Palaeolithic Adaptations at Saint-Césaire, Charente-Maritime, France.* Madison: Monographs in World Archaeology No. 16, Prehistory Press.

Levine, M. A. 1998. Eating horses: the evolutionary significance of hippophagy. *Antiquity* **72**:90-100.

Lewis, H. A. G., and Geelan, P. J. M. 1993. *The Times Atlas of the World. Comprehensive Edition.* Edinburgh: Bartholomew.

Lewis, S. G. 1998. "Quaternary Stratigraphy and Lower Palaeolithic Archaeology of the Lark Valley, Suffolk," in *Stone Age Archaeology: Essays in honour of John Wymer*. Edited by N. Ashton, F. Healy, and P. Pettitt, pp. 43-51. Oxford: Oxbow Books.

Lewis, S. G., Ashton, N., Parfitt, S. A., and White, M. 2000. "Hoxne, Suffolk (TM 176769)," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 149-153. London: Quaternary Research Association.

Lin, J.-P., and Liaw, K.-L. 2000. Labor migrations in Taiwan: characterization and interpretation based on the data of the 1990 Census. *Environment and Planning A* **32**:1689-1709.

Lindenmayer, D. B., and Lacy, R. C. 1995. Metapopulation Viability of Leadbeater's Possum, Gymnobelideus Leadbeateri, in Fragmented Old-Growth Forests. *Ecological Applications* **5**:164-182.

Lioubine, V. P. 2000. "Acheulean of the Caucasus (aspects of chronology, palaeoecology and adaptation)," in *Early Humans at the Gates of Europe*. Edited by D. Lordkipanidze, O. Bar-Yosef, and M. Otte, pp. 147. Liege: University of Liege.

Lioubine, V. P. 2002. *L'Acheuléen du Caucase*. Liege: University of Liege ERAUL 93.

Ljubin, V. P., and Bosinski, G. 1995. "The earliest occupation of the Caucasus region," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 207-253. Leiden: University of Leiden Press.

Lopez Antonanzas, R., and Cuenca Bescos, G. 2002. The Gran Dolina site (Lower to Middle Pleistocene, Atapuerca, Burgos, Spain): new palaeoenvironmental data based on the distribution of small mammals. *Palaeogeography, Palaeoclimatology, Palaeoecology* **186**:311-334.

López Bayón, I. 1998. "La faune de Siuren I (Crimée): analyse préliminaire," in *Préhistoire d'Anatolie. Genèse de deux mondes. Volume 1. Actes du colloque international Liège, 28 avril-3 mai 1997*. Edited by M. Otte, pp. 415-425. Liege: University of Liege ERAUL 85.

Louis, M., and Drouot, E. 1953. Les Baumes Latrone (Commune de Sainte Anastasie-Gard). *Cahiers Ligures de Prehistoire et Archeologie* **2**:3-8.

Lubine, V. P., Tcherniachovski, A. G., Barychnikov, G. F., Levkovskaia, G. M., and Selivanova, N. B. 1985. La Grotte de Koudaro I (Résultats de recherches pluridisciplinaires). *L'Anthropologie* **89**:159-180.

Mace, G. M., Harvey, P. H., and Clutton-Brock, T. H. 1983. "Vertebrate home-range size and energetic requirements," in *The Ecology of Animal Movement*. Edited by I. R. Swingland and P. J. Greenwood, pp. 32-53. Oxford: Clarendon Press.

Mace, R. 2000. Evolutionary ecology of human life history. *Animal Behaviour* **59**:1-10.

Malez, M. 1976. "Excavation of the villafranchian site Sandalja I near Pula," in *Les Premieres Industries de l'Europe*. Edited by K. Valoch, pp. 104-123. Brno: Moravian Museum.

Mallegni, F., Bertoldi, F., and Carnieri, E. 2002. New Middle Pleistocene human remains from Northern Italy. *Homo* **52**:233-239.

Mallegni, F., Carnieri, E., Bisconti, M., Tartarelli, G., Ricci, S., and Segre, A. 2003. *Homo cepranensis sp. nov.* and the evolution of African-European Middle Pleistocene hominids. *C. R. Palevol* **2**:153-159.

Malone, D. 1987. Mechanisms of hominoid dispersal in Miocene East Africa. *Journal of Human Evolution* **16**:469-481.

Mania, D. 1984. Zur Geochronologie des Mittelpleistozäns und einiger Paläolithischer fundstellen im Saale- und Mittleren Elbegebiet. *Arbeits- und Forschungsberichte zur sächs. Bodendenkmalpflege* **27/28**:13-58.

Mania, D. 1988. Le Paléolithique Ancien et Moyen de la Région de la Saale et de l'Elbe, Allemagne de l'est. *L'Anthropologie* **92**:1051-1092.

Mania, D. 1990. *Auf den Spuren des Urmenschen: Die Funde aus der Steinrinne von Bilzingsleben*. Berlin: Deutscher Verlag der Wissenschaften.

Mania, D. 1995. "The earliest occupation of Europe: the Elbe-Saale region (Germany)," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France) 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 85-101. Leiden: University of Leiden Press.

Manzi, G. 2001. "The Earliest Diffusion of the Genus Homo Toward Asia and Europe: a Brief Overview," in *Humanity from African Naissance to Coming Millennia.* Edited by P. V. Tobias, M. A. Raath, J. Moggi-Cecchi, and G. A. Doyle, pp. 117-124. Firenze: Firenze University Press.

Manzi, G., Mallegni, F., and Ascenzi, A. 2001. A cranium for the earliest Europeans: Phylogenetic position of the hominid from Ceprano, Italy. *Proceedings of the National Academy of Sciences of the USA* **98**:10011-10016.

Marambat, L. 1992. "Paléoenvironnements végétaux à Temnata. La séquence aurignacienne," in *Temnata Cave: Excavations in Karlukovo Karst Area, Bulgaria, volume 2, part 1*. Edited by B. Ginter, J. K. Kozlowski, J.-L. Guadelli, and H. Laville, pp. 37-51. Krakow: Jagellonian University Press.

Marks, A. E. 1998. "A new Middle to Upper Paleolithic transitional assemblage from Buran-Kaya III, level C: a preliminary report," in *Préhistoire d'Anatolie: Genèse de deux mondes. Actes du colloque international Liège, 28 avril-3 mai 1997. Volume II.* Edited by M. Otte, pp. 353-366. Liege: University of Liege ERAUL 85.

Marks, A. E., and Monigal, K. 2000. "The Middle to Upper Paleolithic Interface at Buran-Kaya-III, Eastern Crimea," in *Neanderthals and Modern Humans-Discussing the Transition: Central and Eastern Europe from 50.000-30.000*

B.P. Edited by J. Orschiedt and G.-C. Weniger, pp. 212-226. Mettmann: Neanderthal Museum.

Maroto, J., Soler, N., and Fullola, J. M. 1996. "Cultural change between Middle and Upper Palaeolithic in Catalonia," in *The Last Neanderthals, The First Anatomically Modern Humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40Ka BP.* Edited by E. Carbonell and M. Vaquero, pp. 219-250: Grafiques Lluc.

Marshall, L. G. 1981. "The Great American Interchange -- An Invasion Induced Crisis for South American Mammals," in *Biotic Crises in Ecological and Evolutionary Time*. Edited by M. H. Nitecki, pp. 133-229. New York: Academic Press.

Marshall, L. G. 1988. "Extinction," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions.* Edited by A. A. Myers and P. S. Giller, pp. 219-254. London: Chapman and Hall.

Martinez Navarro, B., Turq, A., Ballester, J. A., and Oms, O. 1997. Fuente Nueva-3 (Orce, Granada, Spain) and the first human occupation of Europe. *Journal of Human Evolution* **33**:611-620.

Martínez Navarro, B. 1992. "Estudio cuantitativo y consideraciones paleoecológicas de la comunidad de mamíferos del yacimiento de Venta Micena (Orce, Granada)," in *Presencia humana en el Pleistoceno inferior de Granada y Murcia, Proyecto Orce-Cueva Victoria (1988-1992).* Edited by J. Gibert, pp. 155-187. Granada: Ayuntamiento de Orce.

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., and Pellegrino, A. 1993. Theories of International Migration: A Review and Appraisal. *Population and Development Review* **19**:431-466.

Massey, D. S., and Espinosa, K. E. 1997. What's driving Mexico-U. S. Migration? A Theoretical, Empirical, and Policy Analysis. *American Journal of Sociology* **102**:939-999.

McBrearty, S., and Brooks, A. S. 2000. The revolution that wasn't: a new interpretation of the origin of modern human behavior. *Journal of Human Evolution* **39**:453-563.

McGrew, W. C. 1992. *Chimpanzee material culture: implications for human evolution.* Cambridge: Cambridge University Press.

McKee, J. K. 2001. Faunal turnover rates and mammalian biodiversity of the late Pliocene and Pleistocene of eastern Africa. *Paleobiology* **27**:500-511.

Meireles, J., and Cunha-Ribeiro, J. P. 1996. "Raw materials in the Lower Palaeolithic of Portugal," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula.* Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 141-146. Oxford: British Archaeological Reports International Series 649.

Mellars, P. 1996. *The Neanderthal Legacy: An Archaeological Perspective from Western Europe*. Princeton: Princeton University Press.

Mellars, P. 1998. The fate of the Neanderthals. *Nature* **395**:539-540.

Mellars, P. 1999. The Neanderthal Problem Continued. *Current Anthropology* **40**:341-364.

Mellars, P. A., Bricker, H. M., Gowlett, J. A. J., and Hedges, R. E. M. 1987. Radiocarbon Accelarator Dating of French Upper Palaeolithic Sites. *Current Anthropology* **28**:128-133.

Mercier, N., Valladas, H., Valladas, G., Reyss, J.-L., Jelinek, A., Meignen, L., and Joron, J.-L. 1995. TL Dates of Burnt Flints from Jelinek's Excavations at Tabun and their Implications. *Journal of Archaeological Science* **22**:495-509.

Mezzena, F., and Palma di Cesnola, A. 1971. Industria acheuleana in situ nei depositi esterni della Grotta Paglicci (Rignano Garganico-Foggia). *Rivista di Scienze Preistoriche* **26**:3-29.

Michaux, J., Cheylan, G., and Croset, H. 1990. "Of mice and men," in *Biological Invasions in Europe and the Mediterranean Basin*. Edited by F. di Castri, A. J. Hansen, and M. Debussche, pp. 263-284. Dordrecht: Kluwer Academic Press.

Michel, D. 1982. Le gisement préhistorique de Port Pignot à Fermanville (Manche). *Gallia Préhistoire* **25**:1-68.

Milliken, S. 1997. The earliest occupation of Italy. *Accordia Research Papers*:7-36.

Milliken, S., La Rosa, M., and Perett, C. 1998. "An experimental approach to the reconstruction of the chaines operatoires in a Lower Palaeolithic pebble industry from West-Central Italy," in *Proceedings of the XIII International Congress of Prehistoric and Protohistoric Sciences, Forli, Italia, 8/14 September 1996*. Edited by C. Peretto and C. Giunchi, pp. 751-758. Forli: A.B.A.C.O. Edizioni.

Millington, J. 2000. Migration and Age: The Effect of Age on Sensitivity to Migration Stimuli. *Regional Studies* **34**:521-533.

Milroy, J., and Milroy, L. 1997. "Social network and patterns of language change," in *Migrations and Invasions in Archaeological Explanation*. Edited by J. Chapman and H. Hamerow, pp. 73-81. Oxford: British Archaeological Reports International Series 664.

Mink, L. O. 1978. "Narrative Form as a Cognitive Instrument," in *The Writing of History: Literary Form and Historical Understanding*. Edited by R. H. Canary and H. Kozicki, pp. 129-149. Madison: University of Wisconsin Press.

Minzoni-Déroche, A. 1992. Üçagizli Magara, un site aurignacien dans le Hatay (Anatolie) premiers resultats. *Paléorient* **18**:89-96.

Mithen, S., and Reed, M. 2002. Stepping out: a computer simulation of hominid dispersal from Africa. *Journal of Human Evolution* **43**:433-462.

Moigne, A.-M. 1988. Les restes osseux de Cagny-Cimetière. *Revue archéologique de Picardie* **1988**:73.

Moisan, L. 1987. *Les formations alluviales du bassin inférieur de la Dordogne et leurs industries paléolithiques.* Paris: Editions du C.N.R.S.

Moloney, N. 1992. Lithic production and raw material exploitation at the Middle Pleistocene site of El Sartalejo, Spain. *Papers from the Institute of Archaeology* **3**:11-23.

Moloney, N. 1996. "The effect of quartzite pebbles on the technology and typology of Middle Pleistocene lithic assemblages in the Iberian peninsula," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula.* Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 107-124. Oxford: British Archaeological Reports International Series 649.

Monigal, K. 2001. "The Eastern Szeletian at Buran Kaya III (Crimea, Ukraine) and its place in the Middle to Upper Paleolithic Transition," in *Questioning the Answers: Re-solving Fundamental Problems of the Early Upper Paleolithic.* Edited by M. A. Hays and P. T. Thacker, pp. 51-64. Oxford: British Archaeological Reports International Series 1005.

Monnier, J.-L. 1982. Le paléolithique inférieur et moyen en Bretagne. Habitats et économie des matières premières. *Bulletin de l'Association Française pour l'Etude du Quaternaire* **10-11**:93-104.

Monnier, J.-L., and Le Cloirec, R. 1985. Le gisment palélithique inférieur de la Pointe de Saint-Colomban à Carnac (Morbihan). *Gallia Préhistoire* **28**:7-36.

Monnier, J.-L. 1988. Organisation de l'espace et des habitats paléolithiques en Bretagne. *Revue archéologique de Picardie* **1988**:81-89.

Monnier, J.-L., and Despriée, J. 1991. "Les plus anciennes industries dans le Nord-Ouest de la France," in *Les Premiers Européens. Actes du 114e Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989).* Edited by E. Bonifay and B. Vandermeersch, pp. 39-45. Paris: Editions du C.T.H.S.

Monnier, J.-L., and Molines, N. 1993. Le Colombanien: un faciès régioinal du Paléolithique inférieur sur le littoral armoricano-atlantique. *Bulletin de la Société Préhistorique Française* **90**:283-294.

Mooney, H. A., and Hofgaard, A. 1999. "Biological invasions and global change," in *Invasive Species and Biodiversity Management.* Edited by O. T. Sandlund, P. J. Schei, and A. Viken, pp. 139-148. Dordrecht: Kluwer Academic Press.

Morin, D., and Jacquemot, D. 1976. Une station à quartzites du Paléolithique inférieur dans la région messine: le Piorier d'Armenstein (Moselle). *Bulletin de la Société Préhistorique Française* **73**:135-141.

Mosquera Martinez, M. 1996. "Differential use of the space and raw materials at the Sierra de Atapuerca sites (Burgos, Spain): an approach to some economic and ecological inferences," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula.* Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 81-88. Oxford: British Archaeological Reports International Series 649.

Moulton, M. P., and Pimm, S. L. 1986. "Species Introductions to Hawaii," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 231-249. New York: Springer-Verlag.

Movius, H. L. 1975. *Excavation of the Abri Pataud, Les Eyzies (Dordogne).* Cambridge Massachusetts: American School of Prehistoric Research Bulletin 30.

Muheisen, M. 1988. "A Survey of Prehistoric sites in the Jordan Valley (1985)," in *The Prehistory of Jordan: The State of Research in 1986*. Edited by A. N. Garrard and H. G. Gebel, pp. 503-523. Oxford: British Archaeological Reports International Series 396.

Muhesen, S. 1993. "L'Acheuléen récent évolué de l'Oronte," in *Le Paléolithique de la vallée moyenne de l'Oronte (Syrie): Peuplement et environnement*. Edited by P. Sanlaville, J. Besançon, L. Copeland, and S. Muhesen, pp. 145-166. Oxford: British Archaeological Reports International Series 587.

Munaut, A.-V. 1988. L'Environnement végétal de quelques dépôts quaternaires du bassin de la Somme (France). *Revue archéologique de Picardie* **1988**:45-56.

Münzel, S., Morel, P., and Hahn, J. 1994. Jungpleistozäne Tierreste aus der Geißenklösterle-Höhle bei Blaubeuren. *Fundberichte aus Baden-Württemberg* **19**:63-93.

Musil, R. 1968. Stranská skalá: Its Meaning for Pleistocene Studies. *Current Anthropology* **9**:534-539.

Musil, R. 1995. *Stránská Skála Hill: Excavation of open-air sediments 1964-1972*. Brno: Moravian Museum.

Musil, R. 2003. "The Middle and Upper Palaeolithic Game Suite in Central and Southeastern Europe," in *Neanderthals and modern humans in the European* *landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 167-190. Cambridge: McDonald Institute for Archaeological Research.

Mussi, M. 1992. *Il Paleolitico e il Mesolitico in Italia. Popoli e Civilta' dell'Italia Antica volume 10*. Bologna: Stilus BSP Editrice s.r.l.

Mussi, M. 1995. "The earliest occupation of Europe: Italy," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 27-49. Leiden: University of Leiden Press.

Myers, A. A., and Giller, P. S. 1988a. "Process, pattern and scale in biogeography," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions*. Edited by A. A. Myers and P. S. Giller, pp. 3-12. London: Chapman and Hall.

Myers, A. A., and Giller, P. S. 1988b. "Biological Processes in Biogeography: Introduction," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions*. Edited by A. A. Myers and P. S. Giller, pp. 149-163. London: Chapman and Hall.

Myers, K. 1986. "Introduced vertebrates in Australia, with emphasis on the mammals," in *Ecology of Biological Invasions*. Edited by R. H. Groves and J. J. Burdon, pp. 120-136. Cambridge: Cambridge University Press.

Naveh, Z., and Vernet, J.-L. 1991. "The palaeohistory of the Mediterranean biota," in *Biogeography of Mediterranean Invasions*. Edited by R. H. Groves and F. di Castri, pp. 19-32. Cambridge: Cambridge University Press.

Newsome, A. E., and Noble, I. R. 1986. "Ecological and Physiological Characters of Invading Species," in *Ecology of Biological Invasions*. Edited by R. H. Groves and J. J. Burdon, pp. 1-20. Cambridge: Cambridge University Press.

Nicolaescu-Plopsor, C. S., and Morosan, I. N. 1959. Sur le commencement du paléolithique en Roumanie. *Dacia* **3**:9-33.

Nicolaescu-Plopsor, C. S., and Nicolaescu-Plopsor, D. 1963. The possible existence of the Proto-Hominids in Rumania's Villafranchian. *Dacia* 7:9-25.

Oberai, A. S., and Singh, H. K. M. 1983. *Causes and Consequences of Internal Migration: A Study in the Indian Punjab*. Delhi: Oxford University Press.

Odland, J., and Ellis, M. 1987. Disaggregate Migration Behavior and the Volume of Interregional Migration. *Geographical Analysis* **19**:111-124.

Oms, O., Pares, J. M., Martinez-Navarro, B., Agusti, J., Toro, I., Martinez-Fernandez, G., and Turq, A. 2000. Early human occupation of Western Europe: Paleomagnetic dates for two paleolithic sites in Spain. *Proceedings of the National Academy of Sciences of the USA* **97**:10666-10670.

Onoratini, G., Ahmamou, M., Defleur, A., and Plaziat, J.-C. 1990. Découverte, près de Fès (Maroc), d'une industrie acheuléenne au sommet des calcaires (saïssiens) réputés pliocènes. *L'Anthropologie* **94**:321-334.

Orians, G. H. 1986. "Site Characteristics Favoring Invasions," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 133-148. New York: Springer-Verlag.

Ortega Martinez, A. I. 1992. "Revisión de la industria lítica del yacimiento Achelense de Torralba del Moral (Soria)," in *Actas del II Symposium de Arqueología Soriana.*, pp. 123-136. Soria: Publicaciones de la Excma. Diputación Provincial de Soria, Colección Temas Sorianos No. 20.

Otte, M., and Keeley, L. H. 1990. The Impact of Regionalism on Palaeolithic Studies. *Current Anthropology* **31**:577-582.

Otte, M. 1994. "Chronologie du Paleolithique Superieur Belge dans le contexte du nord-ouest Europeen," in *El Cuadro Geochronologico del Paleolitico Superior Inicial*. Edited by F. Bernaldo de Quiros, pp. 143-153. Ministerio de Cultura: Museo y Centro de Investigacion de Altamira.

Otte, M., and Straus, L. G. 1995. *Le Trou Magrite: Fouilles 1991-1992*. Liege: ERAUL 69.

Otte, M., Collin, F., Miller, R., and Engesser, K. 1998a. Nouvelles datations du Trou Al'Wesse dans son contexte régional. *Notae Praehistoricae* **18**:45-50.

Otte, M., Yalçinkaya, I., Kozlowski, J., Bar-Yosef, O., López Bayón, I., and Harun, T. 1998b. Long-term technical evolution and human remains in the Anatolian Palaeolithic. *Journal of Human Evolution* **34**:413-431.

Otte, M., and Derevianko, A. P. 2001. The Aurignacian in Altai. *Antiquity* **75**:44-48.

Palma di Cesnola, A. 1975. "Regione Puglia," in *Guida della Preistoria Ittaliana*. Edited by A. M. Radmilli, pp. 153-170. Firenze: Sansoni Editore.

Palmqvist, P. 1997. A critical re-evaluation of the evidence for the presence of hominids in Lower Pleistocene times at Venta Micena, Southern Spain. *Journal of Human Evolution* **33**:83-89.

Palombo, M. R., Abbazzi, L., Agostini, S., Mazza, P., and Mussi, M. 2001. "Middle Pleistocene fauna and lithic implements from Pagliare di Sassa (L'Aquila, Central Italy)," in *The World of Elephants: Proceedings of the First International Congress*. Edited by G. Cavaretta, P. Gioia, M. Mussi, and M. R. Palombo, pp. 224-229. Rome: Consiglio Nazionale della Ricerche.

Paquereau, M. M. 1970. Etude palynologique des niveaux aurignaciens de Caminade-Est (Dordogne). *Quaternaria* **13**:133-135.

Paquereau, M.-M. 1976. "La vegetation au Pleistocene moyen dans le Sud-Ouest," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 491-493. Paris: Centre National de la Recherche Scientifique.

Parenti, F., Al-Shiyab, A. H., Santucci, E., Kafafi, Z., and Palumbo, G. 1997. "Early Acheulean Stone Tools and Fossil Faunas From the Dauqara Formation, Upper Zarqa Valley, Jordanian Plateau," in *The Prehistory of Jordan II. Perspectives from 1997*. Edited by H. G. K. Gebel, Z. Kafafi, and G. O. Rollefson, pp. 7-22. Berlin: Ex Oriente.

Parfitt, S. A. 1998. "Pleistocene Vertebrate Faunas of the West Sussex Coastal Plain: their Stratigraphic and Palaeoenvironmental Significance," in *The Quaternary of Kent and Sussex. Field Guide*. Edited by J. B. Murton, C. A. Whiteman, M. R. Bates, D. R. Bridgland, A. J. Long, M. B. Roberts, and M. P. Waller, pp. 121-135. London: Quaternary Research Association.

Parsons, P. A. 1988. "Adaptation," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions*. Edited by A. A. Myers and P. S. Giller, pp. 165-184. London: Chapman and Hall.

Paterson, T. T., and Fagg, E. B. 1940. Studies on the Palaeolithic Succession in England. No. II. The Upper Brecklandian Acheul (Elveden). *Proceedings of the Prehistoric Society* **6**:1-29.

Patou-Mathis, M., and Boukhima, H. 1993. "Les grands mammifères des grottes des hyènes et du pape à Brassempouy (Landes): résultats préliminaires," in *Pyrénées Préhistoriques: arts et sociétés. Actes du 118e congrés national des* *sociétés historiques et scientifiques*. Edited by H. Delporte and J. Clottes, pp. 457-472. Paris: Editions du C.T.H.S.

Patte, E. 1954. Le crane aurignacien des Cottés. *L'Anthropologie* **58**:450-471.

Patte, M. E. 1956. Gardes: La Quina. *Gallia* **14**:198.

Pavlov, P., Svendsen, J. I., and Indrelid, S. 2001. Human presence in the European Arctic nearly 40,000 years ago. *Nature* **413**:64-67.

Peeters, H., Musch, J., and Wouters, A. 1988a. Les industries acheuléens des Pays-Bas. *L'Anthropologie* **92**:1093-1136.

Peeters, H., Musch, J., and Wouters, A. 1988b. Les plus anciennes industries des Pays-Bas. *L'Anthropologie* **92**:683-710.

Pelegrin, J. 1995. Technologie Lithique: Le Châtelperronien de Roc de Combe (Lot) et de La Côte (Dordogne). *Cahiers du Quaternaire* **20**.

Penalva, C. 1987. Les industries acheuléennes du Portugal. *L'Anthropologie* **91**:45-68.

Peretto, C., and Scarpante, L. 1982. Le industrie del Paleolitico inferiore di Monte Conero (Ancona). *Atti della XXIII Riunione Scientifica dell'Instituto Italiano di Preistoria e Protostoria*:361-382.

Peretto, C. 1995. "Considerations on the Lower Palaeolithic in Italy," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermúdez de Castro, J. L. Arsuaga, and E. Carbonell, pp. 357-365. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Peretto, C., La Rosa, M., Liboni, A., Milliken, S., Sozzi, M., and Zarattini, A. 1997. Le gisement de Quarto delle Cinfonare dans le cadre du paléolithique inférieur de l'Italie Ouest-Centrale. *L'Anthropologie* **101**:597-615.

Perez-Gonzalez, A., Santonja, M., Soto, E., Sese, C., Ruiz Zapata, B., Mora, R., Villa, P., Aleixandre, T., Gallardo, J., and Benito Calvo, A. 1999. "The Archaeo-

Palaeontological Sites of the Middle Pleistocene at Ambrona and Torralba (Soria)," in *The Geological and Palaeontological heritage of Central and Eastern Iberia (Iberian Range, Spain) 1999 III International Symposium proGEO on the conservation of the geological heritage: Field Guide.* Edited by G. Melendez and C. Soria-Llop, pp. 7-42. Madrid: International Union of Geological Sciences Geosites working group.

Perpère, M. 1973. Grands gisements aurignaciens du Poitou. *L'Anthropologie* **77**:683-716.

Perrot, J. 1992. Umm Qatafa and Umm Qala'a: Two Ghassulian Caves in the Judean Desert. *Eretz-Israel* **23**:100-111.

Pettitt, P. B. 1999. Disappearing from the world: an archaeological perspective on Neanderthal extinction. *Oxford Journal of Archaeology* **18**:217-240.

Pettitt, P. B. 2000. Chronology of the Mid Upper Palaeolithic: the radiocarbon evidence. *Analecta Praehistorica Leidensia* **31**:21-30.

Pettitt, P. B., and Pike, A. W. G. 2001. Blind in a cloud of dates: problems with the chronology of Neanderthal extinction and anatomically modern human expansion. *Antiquity* **75**:415-417.

Pettitt, P. B., Davies, W., Gamble, C. S., and Richards, M. B. 2003. Palaeolithic radiocarbon chronology: quantifying our confidence beyond two half-lives. *Journal of Archaeological Science* **30**:1685-1693.

Peyrony, D. 1934. La Ferrassie: Moustérien, Périgordien, Aurignacien. *Préhistoire* **3**:1-92.

Peyrony, D. 1935. Le gisement Castanet, Vallon de Castelmerle, commune de Sergeac (Dordogne). Aurignacien I et II. *Bulletin de la Société Préhistorique Française* **32**:418-443.

Pielou, E. C. 1979. *Biogeography*. New York: John Wiley and Sons.

Piperno, M., Bulgarelli, G. M., and Zevi, F. 1984. *I primi abitanti d'Europa*. Rome: De Luca.

Porat, N., Zhou, L. P., Chazan, M., Noy, T., and Horwitz, L. K. 1999. Dating the Lower Paleolithic Open-Air Site of Holon, Israel by Luminescence and ESR Techniques. *Quaternary Research* **51**:328-341.

Potts, R. 1998. Variability Selection in Hominid Evolution. *Evolutionary Anthropology* 7:81-96.

Poulianos, N. A. 1989. Petralona Cave within Lower-Middle Pleistocene Sites. *Palaeogeography, Palaeoclimatology, Palaeoecology* **73**:287-294.

Pradel, D. L. 1959. Le Périgordien II de la grotte des Cottés (commune de Saint-Pierre-de-Maillé, Vienne). *Bulletin de la Société Préhistorique Française* **56**:421-427.

Pradel, L. 1961. La grotte des Cottés, commune de Saint-Pierre-de-Maillé (Vienne). *L'Anthropologie* **65**:229-258.

Praslov, N. D. 1995. "The earliest occupation of the Russian Plain: a short note," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 61-66. Leiden: University of Leiden Press.

Prat, F., and Thibault, C. 1976. Le gisement de Nauterie à La Romieu (Gers). Fouilles de 1967 a 1973. Nauterie I. *Mémoires du Muséum National d'Histoire Naturelle Série C* **35**:1-82.

Preece, R. C., and Scource, J. D. 1987. "Pleistocene sea-level history in the Bembridge area of the Isle of Wight," in *Wessex and the Isle of Wight. Field*

Guide. Edited by K. Barber, pp. 136-149. Cambridge: Quaternary Research Association.

Preece, R. C., Lewis, S. G., Wymer, J. J., Bridgland, D. R., and Parfitt, S. 1991. "Beeches Pit, West Stow, Suffolk (TL 798719)," in *Central East Anglia and the Fen Basin. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and D. R. Bridgland, pp. 94-104. London: Quaternary Research Association.

Preece, R. C., Bridgland, D. R., Lewis, S. G., Parfitt, S. A., and Griffiths, H. I. 2000. "Beeches Pit, West Stow, Suffolk (TL 798719)," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 185-195. London: Quaternary Research Association.

Propp, V. 1968. *The Morphology of the Folktale. 2nd Edition*. Austin: University of Texas Press.

Protsch, R., and Semmel, A. 1978. Zur Chronologie des Kelsterbach-Hominiden, des ältesten Vertreters des Homo sapiens sapiens in Europa. *Eiszeitalter und Gegenwart* **28**:200-210.

Pulliam, H. R., Dunning, J. B., and Liu, J. 1992. Population Dynamics in Complex Landscapes: A Case Study. *Ecological Applications* **2**:165-177.

Querol, M. A., and Santonja, M. 1979. El Yacimiento Achelense de Pinedo (Toledo). *Excavaciones Arqueologicas en Espana* **106**:1-182.

Querol, M. A. 1984. Le paléolithique inférieur dans le cours moyen du Tage (Espagne). *L'Anthropologie* **88**:143-168.

Radmilli, A. M. 1976. "The First Industries of Italy," in *Les Premières Industries de l'Europe*. Edited by K. Valoch, pp. 35-74. Paris: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Radmilli, A.-M. 1964. *Abruzzo preistorico, Paleolitico inferiore-medio*. Firenze.

Ranov, V. A., Carbonell, E., and Rodriguez, X. P. 1995. Kuldara: Earliest Human Occupation in Central Asia in Its Afro-Asian Context. *Current Anthropology* **36**:337-346.

Raposo, L. 1985. Le Paléolithique inférieur archaïque au Portugal: Bilan des connaissances. *Bulletin de la Société Préhistorique Française* **82**:173-180.

Raposo, L., and Carreira, J. R. 1986. Acerca da existência de complexos industriais pré-acheulenses no território português. *O Arqueólogo Português Série IV* **4**:7-90.

Raposo, L., and Santonja, M. 1995. "The earliest occupation of Europe: the Iberian peninsula," in *The Earliest Occupation of Europe: proceedings of the European Science Foundation workshop at Tautavel (France), 1993*. Edited by W. Roebroeks and T. van Kolfschoten, pp. 7-25. Leiden: University of Leiden.

Ravenstein, E. G. 1885. The laws of migration. *Journal of the Statistical Society* **48**:167-227.

Raynal, J. P., Sbihi Alaoui, F. Z., Geraads, D., Magoga, L., and Mohi, A. 2001. The earliest occupation of North-Africa: the Moroccan perspective. *Quaternary International* **75**:65-75.

Raynal, J.-P., and Texier, J.-P. 1989. Découverte d'Acheuléen ancien dans la carrière Thomas 1 à Casablanca et problème de l'ancienneté de la présence humaine au Maroc. *Comptes Rendus de l'Academie de Sciences de Paris serie II* **308**:1743-1749.

Raynal, J.-P., Geraads, D., Magoga, L., El Hajraoui, A., Texier, J.-P., Lefevre, D., and Sbihi-Alaoui, F.-Z. 1993. La Grotte des Rhinocéros (Carrière Oulad Hamida 1, anciennement Thomas III, Casablanca), nouveau site acheuléen du Maroc atlantique. *Comptes Rendus de l'Academie de Sciences de Paris serie II* **316**:1477-1483.

Raynal, J.-P., Magoga, L., and Bindon, P. 1995a. "Tephrofacts and the first human occupation of the French Massif Central," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 129-146. Leiden: University of Leiden Press.

Raynal, J.-P., Magoga, L., Sbihi-Alaoui, F.-Z., and Geraads, D. 1995b. "The earliest occupation of Atlantic Morocco: the Casablanca evidence," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 255-262. Leiden: University of Leiden Press.

Renault-Miskovsky, J. 1995. "Middle Pleistocene vegetation and palaeoclimatology in the French Mediterranean Basin," in *Human Evolution in Europe and the Atapuerca Evidence.* Edited by J.-M. Bermudez, J.-L. Arsuaga, and E. Carbonell, pp. 75-98. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Rhodes, E. J., Raynal, J.-P., Geraads, D., and Sbihi-Alaoui, F.-Z. 1994. Premières dates RPE pour l'Acheuléen du Maroc atlantique (Grotte des Rhinocéros, Casablanca). *Comptes Rendus de l'Academie de Sciences de Paris serie II* **319**:1109-1115.

Ricoeur, P. 1980. Narrative Time. *Critical Inquiry* **7**:169-190.

Riek, G. 1933. Les civilisations paléolithiques du Vogelherd près de Stetten-ob-Lonetal (Wurtemberg). *Préhistoire* **2**:149-181.

Rigaud, J.-P. 1976. "Le Flageolet," in *UISPP Field Guide A4.*, pp. 99-102.

Rigaud, J.-P. 1982. Le Paléolithique en Périgord: les données du Sud-Ouest Sarladais et leurs implications. Unpublished Ph.D Thesis, Université de Bordeaux I.

Rigaud, J.-P. 1989. *La Grotte Vaufrey à Cenac et Saint-Julien (Dordogne): paleoenvironnements, chronologie et activites humaines.* Paris: Centre National de la Recherche Scientifique.

Rigaud, J.-P. 1991. Abri Pataud. *Gallia Informations* **1991**:21.

Rightmire, G. P. 2001. Patterns of hominid evolution and dispersal in the Middle Pleistocene. *Quaternary International* **75**:77-84.

Roberts, M. B., Gamble, C. S., and Bridgland, D. R. 1995. "The earliest occupation of Europe: the British Isles," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France) 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 165-191. Leiden: University of Leiden Press.

Roberts, M. B., and Parfitt, S. A. 1999. *Boxgrove: A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex.* London: English Heritage.

Roberts, M. R. 1998. "Middle Pleistocene sediments and archaeology at ARC Eartham Quarry, Boxgrove, West Sussex," in *The Quaternary of Kent and Sussex. Field Guide.* Edited by J. B. Murton, C. A. Whiteman, M. R. Bates, D. R. Bridgland, A. J. Long, M. B. Roberts, and M. P. Waller, pp. 187-213. London: Quaternary Research Association.

Rodríguez, X. P., Carbonell, E., and Ortega, A. I. 2001. Historique des découvertes préhistoriques de la Sierra de Atapuerca (Burgos, Espagne) et perspectives du futur. *L'Anthropologie* **105**:3-12.

Roe, D. A. 1968. *A Gazetteer of British Lower and Middle Palaeolithic Sites.* London: Council for British Archaeology.

Roe, D. A. 1981. *The Lower and Middle Palaeolithic Periods in Britain.* London: Routledge and Kegan Paul.

Roe, D. A. 1995. The Orce Basin (Andalucía, Spain) and the Initial Palaeolithic of Europe. *Oxford Journal of Archaeology* **14**:1-12.

Roebroeks, W. 1986. On the Lower Paleolithic Site La Belle Roche: An Alternative Interpretation. *Current Anthropology* **27**:369-370.

Roebroeks, W., Conard, N. J., and van Kolfschoten, T. 1992. Dense Forests, Cold Steppes, and the Palaeolithic Settlement of Northern Europe. *Current Anthropology* **33**:551-586.

Roebroeks, W. 1994. Updating the Earliest Occupation of Europe. *Current Anthropology* **35**:301-305.

Roebroeks, W., and van Kolfschoten, T. Editors. 1995. *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Leiden: University of Leiden Press.

Rogerson, P. A. 1984. New directions in the modelling of interregional migration. *Economic Geography* **60**:111-121.

Rolland, N. 1978. "The interpretation of Euro-African distributional features during the Early Palaeolithic," in *Diffusion and Migration. Their Roles in Cultural Development*. Edited by P. G. Duke, J. Ebert, G. Langemann, and A. P. Buchner, pp. 125-143. Calgary: University of Calgary Press.

Rolland, N. 1981. The Interpretation of Middle Palaeolithic Variability. *Man* **16**:15-42.

Rolland, N. 1986. "Recent findings from La Micoque and other sites in South-western and Mediterranean France: their bearing on the Tayacian problem and middle palaeolithic emergence," in *Stone Age Prehistory: Studies in Memory of*

Charles McBurney. Edited by G. N. Bailey and P. Callow, pp. 121-151. Cambridge: Cambridge University Press.

Rolland, N. 1988. "Observations on Some Middle Palaeolithic Time Series in Southern France," in *Upper Pleistocene Prehistory of Western Eurasia*. Edited by H. L. Dibble and A. Montet-White, pp. 161-180. Philadelphia: University of Pennsylvania Press.

Rolland, N. 1990. "Middle Palaeolithic Socio-Economic Formations in Western Eurasia: an Exploratory Survey," in *The Emergence of Modern Humans: An Archaeological Perspective*. Edited by P. Mellars, pp. 347-388. Edinburgh: Edinburgh University Press.

Rolland, N. 1992. The Palaeolithic Colonization of Europe: An Archaeological and Biogeographic Perspective. *Trabajos de Prehistoria* **49**:69-111.

Rolland, N. 1995. "Biogeographie et prehistoire: le cas du peuplement paleolithique inferieur de l'Europe," in *Nature et Culture*. Edited by M. Otte, pp. 11-61. Liege: University of Liege.

Rolland, N. 1996. "Later Pleistocene Complexity: The Middle Palaeolithic Antecedent," in *Debating Complexity: Proceedings of the 26th Annual Chacmool Conference*. Edited by D. A. Meyer, P. C. Dawson, and D. T. Hanna, pp. 193-201. Calgary: University of Calgary Press.

Rolland, N. 1998a. A Key Reference on Early Hominids in Europe. *Current Anthropology* **39**:169-171.

Rolland, N. 1998b. "The Lower Palaeolithic settlement of Eurasia, with special reference to Europe," in *Early human behaviour in the global context: the rise and diversity of the Lower Palaeolithic record*. Edited by M. D. Petraglia and R. Korisettar, pp. 187-220. London: Routledge.

Rolland, N. 1999. "The Middle Palaeolithic as Development Stage: Evidence from Technology, Subsistence, Settlement Systems, and Hominid Socio-ecology," in *Hominid Evolution: Lifestyles and Survival Strategies*. Edited by H. Ullrich, pp. 315-334. Gelsenkirchen: Edition Archaea.

Rolland, N. 2001. "The initial peopling of Eurasia and the early occupation of Europe in its Afro-Asian context: major issues and current perspectives," in *A Very Remote Period Indeed: Papers on the Palaeolithic presented to Derek Roe*. Edited by S. Milliken and J. Cook, pp. 78-94. Oxford: Oxbow Books.

Ron, H., Porat, N., Ronen, A., Tchernov, E., and Horwitz, L. K. 2003. Magnetostratigraphy of the Evron Member- implications for the age of the Middle Acheulean site of Evron Quarry. *Journal of Human Evolution* **44**:633-639.

Ron, T., Henzi, S. P., and Motro, U. 1994. A new model of fission in primate troops. *Animal Behaviour* **47**:223-226.

Ronen, A., and Ohel, M. Y. 1980. Acheulean Artifacts from Two Trenches at Ma'ayan Barukh. *Israel Exploration Journal* **30**:17-33.

Ronen, A., Burdukiewicz, J.-M., Laukhin, S. A., Winter, Y., Tsatskin, A., Dayan, T., Kulikov, O. A., Vlasov, V. K., and Semenov, V. V. 1998. The Lower Palaeolithic Site Bizat Ruhama in the Northern Negev, Israel. *Archäologisches Korrespondenzblatt* **28**:163-173.

Rosas, A., Pérez-González, A., Carbonell, E., van der Made, J., Sánchez, A., Laplana, C., Cuenca Bescos, G., Pares, J. M., and Huguet, R. 2001. Le gisement pléistocène de la "Sima del Elefante" (Sierra de Atapuerca, Espagne). *L'Anthropologie* **105**:301-312.

Rosen, B. R. 1988. "Biogeographic patterns: a perceptual overview," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions*. Edited by A. A. Myers and P. S. Giller, pp. 23-55. London: Chapman and Hall.

Roughgarden, J. 1986. "Predicting Invasions and Rates of Spread," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 179-188. New York: Springer-Verlag.

Ruff, C., and Walker, A. 1993. "Body size and body shape," in *The Nariokotome Homo erectus Skeleton*. Edited by A. Walker and R. Leakey, pp. 234-265. Cambridge, Massachusetts: Harvard University Press.

Ruis Bustos, A., and Michaux, J. 1976. Le site préhistorique nouveau de Cullar de Baza-1 (Province de Grenade, Espagne), d'âge pléistocène moyen. Etude préliminaire et analyse de la faune des Rongeurs. *Géologie méditerranéenne* **3**:173-182.

Ruiz Bustos, A., Toro Moyano, I., Martin Suarez, E., and Almohalla Gallego, M. 1982. Procesos evolutivos durante el Cuaternario Medio y Superior en las poblaciones de pequeños mamíferos del Sur de la Península Ibérica. Condiciones climáticas que implican e importancia bioestratigráfica. *Cuadernos de Prehistoria de la Universidad de Granada* **7**:9-35.

Sacchi, D. 1976. "Le paléolithique supérieur de Canecaude I (Villardonnel, Aude)," in *Livret-Guide de l'excursion C2: Provence et Languedoc méditerranéen sites paléolithiques et néolithiques*. Edited by H. de Lumley, pp. 286-292. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Sackett, J. 1999. *The Archaeology of Solvieux: An Upper Palaeolithic Open Air Site in France*. Los Angeles: Institute of Archaeology, University of California.

Sahnouni, M. 1995. "A new look at the Lower Palaeolithic site at Ain Hanech, Algeria," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermúdez de Castro, J. L. Arsuaga, and E. Carbonell, pp. 345-355. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Sahnouni, M., de Heinzelin, J., Brown, F., and Saoudi, Y. 1996. Récentes recherches dans le gisement oldowayen d'Ain Hanech, Algérie. *Comptes Rendus de l'Academie de Sciences de Paris serie IIA* **323**:639-644.

Sahnouni, M. 1998. *The Lower Palaeolithic of the Maghreb: Excavations and analyses at Ain Hanech, Algeria*. Oxford: British Archaeological Reports International Series 689.

Sahnouni, M., Hadjouis, D., van der Made, J., Derradji, A.-e.-K., Canals, A., Medig, M., Belahrech, H., Harichane, Z., and Rabhi, M. 2002. Further research at the Oldowan site of Ain Hanech, North-eastern Algeria. *Journal of Human Evolution* **43**:925-937.

Saltz, D., and Rubenstein, D. I. 1995. Population Dynamics of a Reintroduced Asiatic Wild Ass (Equus Hemionus) Herd. *Ecological Applications* **5**:327-335.

Samways, M. J., Osborn, R., Hastings, H., and Hattingh, V. 1999. Global climate change and accuracy of prediction of species' geographical ranges: establishment success of introduced ladybirds (Coccinellidae, Chilocorus spp.) worldwide. *Journal of Biogeography* **26**:795-812.

Sanlaville, P. 1979. *Quaternaire et Préhistoire du Nahr el Kébir Septentrional*. Paris: CNRS.

Santonja, M., and Villa, P. 1990. The Lower Palaeolithic of Spain and Portugal. *Journal of World Prehistory* **4**:45-94.

Santonja, M., Moissenet, E., and Perez Gonzalez, A. 1992. Cuesta de la Bajada (Teruel). Nuevo sítio Paleolítico Inferior. *Boletin del Seminario de Estudios de Arte y Arqueologia de la Universidad de Valladolid* **58**:25-45.

Santonja, M. 1995. "The Lower Paleolithic in the northern Submeseta and in the environs of Atapuerca. State of knowledge in 1992," in *Human Evolution in Europe and the Atapuerca Evidence*. Edited by J. M. Bermúdez, J. L. Arsuaga, and E. Carbonell, pp. 421-444. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Santonja, M. 1996. "The Lower Palaeolithic in Spain: Sites, raw material and occupation of the land," in *Non-Flint Stone Tools and the Palaeolithic Occupation of the Iberian Peninsula*. Edited by N. Moloney, L. Raposo, and M. Santonja, pp. 1-20. Oxford: British Archaeological Reports International Series 649.

Saragusti, I., and Goren-Inbar, N. 2001. The biface assemblage from Gesher Benot Ya'aqov, Israel: illuminating patterns in Out of Africa dispersal. *Quaternary International* **75**:85-89.

Sarti, A., and Stoduti, P. 1982. "Stazione litica riferibile alla "Pebble Culture" scoperta nel Livornese." *Atti della XXIII Riunione Scientifica dell'Instituto Italiano di Preistoria e Protostoria, 1982*, pp. 447-461.

Savage, D. E., and Russell, D. E. 1983. *Mammalian Paleofaunas of the World.* London: Addison-Wesley Publishing Company.

Sax, D. F., and Brown, J. H. 2000. The paradox of invasion. *Global Ecology and Biogeography* **9**:363-371.

Schepartz, L. A., Miller-Antonio, S., and Bakken, D. A. 2000. Upland resources and the early Palaeolithic occupation of Southern China, Vietnam, Laos, Thailand and Burma. *World Archaeology* **32**:1-13.

Schoner, T. W. 1988. "Ecological Interactions," in *Analytical Biogeography: An Integrated Approach to the Study of Animal and Plant Distributions*. Edited by A. A. Myers and P. S. Giller, pp. 255-297. London: Chapman and Hall.

Schreve, D. C. 2000. "The vertebrate assemblage from Hoxne, Suffolk," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 155-163. London: Quaternary Research Association.

Schultz, J. 1995. *The Ecozones of the World: The Ecological Divisions of the Geosphere*. Berlin: Springer-Verlag.

Seddon, B. 1971. *Introduction to Biogeography*. London: Duckworth Press.

Segre, A., and Ascenzi, A. 1984. Fontana Ranuccio: Italy's Earliest Middle Pleistocene Hominid Site. *Current Anthropology* **25**:230-233.

Segre, A. G., and Biddittu, I. 1981. Paleolitico inferiore: le piu' antiche tracce dell'attivita' umana nella Valle del Sacco. *Quaderni del Centro di Studio per l'Archeologia Etrusco-Italica* **5**:26-34.

Seidl, I., and Tisdell, C. A. 1999. Carrying capacity reconsidered: from Malthus' population theory to cultural carrying capacity. *Ecological Economics* **31**:395-408.

Sevink, J., Hebeda, E. H., Priem, H. N. A., and Verschure, R. H. 1981. A Note on an Approximately 730,000-Year-Old Mammal Fauna and Associated Human Activity Sites near Isernia, Central Italy. *Journal of Archaeological Science* **8**:105-106.

Shennan, S. 1988. *Quantifying Archaeology*. Iowa: University of Iowa Press.

Shigesada, N., and Kawasaki, K. 1997. *Biological Invasions: Theory and Practice*. Oxford: Oxford University Press.

Shipman, P., and Rose, J. 1983. Evidence of Butchery and Hominid Activities at Torralba and Ambrona; An Evaluation Using Microscopic Techniques. *Journal of Archaeological Science* **10**:465-474.

Shotten, F. W., Keen, D. H., Coope, G. R., Currant, A. P., Gibbard, P. L., Aalto, M., Peglar, S. M., and Robinson, J. E. 1993. The Middle Pleistocene deposits of Waverley Wood Pit, Warwickshire, England. *Journal of Quaternary Science* **8**:293-325.

Simberloff, D. 1981. "Community Effects of Introduced Species," in *Biotic Crises in Ecological and Evolutionary Time*. Edited by M. H. Nitecki, pp. 53-81. New York: Academic Press.

Simberloff, D. 1986. "Introduced species: A biogeographic and systematic perspective," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 3-26. New York: Springer-Verlag.

Simberloff, D., and Von Holle, B. 1999. Positive interactions of nonindigenous species: invasional meltdown? *Biological Invasions* **1**:21-32.

Simpson, G. G. 1936. Data on the relationships of local and continental mammalian faunas. *Journal of Palaeontology* **10**:410-414.

Singer, R., Gladfelter, B. G., and Wymer, J. J. 1993. *The Lower Paleolithic Site at Hoxne, England*. Chicago: University of Chicago Press.

Sjaastad, L. A. 1962. The costs and returns of human migration. *Journal of Political Economy* **70**:80-93.

Skeldon, R. 1990. *Population Mobility in Developing Countries: A Reinterpretation.* London: Belhaven Press.

Skeldon, R. 1997. *Migration and Development: A Global Perspective.* Harlow: Longman.

Skellam, J. G. 1951. Random dispersal in theoretical populations. *Biometrika* **38**:196-218.

Soffer, O. 1985. *The Upper Paleolithic of the Central Russian Plain.* San Diego: Academic Press.

Soffer, O. 1989. "The Middle to Upper Palaeolithic Transition on the Russian Plain," in *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans.* Edited by P. Mellars and C. Stringer, pp. 714-742. Edinburgh: Edinburgh University Press.

Soler i Masferrer, N., and Maroto i Genover, J. 1987. Els nivells d'occupació del Paleolític Superior a la cova de l'Arbreda (Serinyà, Girona). *Cypsela* **6**:221-228.

Steele, J., Adams, J., and Sluckin, T. 1998. Modelling Paleoindian dispersals. *World Archaeology* **30**:286-305.

Steele, J., and Rockman, M. 2003. ""Where do we go from here?" Modelling the decision-making process during exploratory dispersal," in *Colonization of Unfamiliar Landscapes: The archaeology of adaptation.* Edited by M. Rockman and J. Steele, pp. 130-143. London: Routledge.

Stekelis, M., and Gilead, D. 1966. *Ma'ayan Barukh: A Lower Palaeolithic site in Upper Galilee.* Jerusalem: Centre for Prehistoric Research.

Stenseth, N. C., and Lidicker, W. Z. J. 1992a. "The study of dispersal: a conceptual guide," in *Animal Dispersal: Small Mammals as a Model*. Edited by N. C. Stenseth and W. Z. J. Lidicker, pp. 5-20. London: Chapman and Hall.

Stenseth, N. C., and Lidicker, W. Z. J. 1992b. "Presaturation and saturation dispersal 15 years later: some theoretical considerations," in *Animal Dispersal: Small Mammals as a Model*. Edited by N. C. Stenseth and W. Z. J. Lidicker, pp. 201-223. London: Chapman and Hall.

Stewart, J. R., van Kolfschoten, T., Markova, A., and Musil, R. 2003a. "Neanderthals as Part of the Broader Late Pleistocene Megafaunal Extinctions?," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 221-231. Cambridge: McDonald Institute for Archaeological Research.

Stewart, J. R., van Kolfschoten, T., Markova, A., and Musil, R. 2003b. "The Mammalian Faunas of Europe during Oxygen Isotope Stage Three," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project*. Edited by T. H. van Andel and W. Davies, pp. 103-130. Cambridge: McDonald Institute for Archaeological Research.

Stouffer, S. A. 1940. Intervening Opportunities: A Theory Relating Mobility and Distance. *American Sociological Review* **5**:845-867.

Straus, L. G., and Clark, G. A. 1986. *La Riera Cave: Stone Age Hunter-Gatherer Adaptations in Northern Spain*. Arizona State University: Anthropological Research Papers No. 36.

Straus, L. G., Bischoff, J. L., and Carbonell, E. 1993. A review of the Middle to Upper Palaeolithic transition in Iberia. *Prehistoire Europeenee* **3**:11-27.

Straus, L. G. 1996. "Continuity or rupture; convergence or invasion; adaptation or catastrophe; mosaic or monolith: views on the Middle to Upper Paleolithic Transition in Iberia," in *The Last Neanderthals, The First Anatomically Modern Humans: a tale about the human diversity. Cultural change and human evolution: the crisis at 40Ka BP*. Edited by E. Carbonell and M. Vaquero, pp. 203-218: Grafiques Lluc.

Straus, L. G. 2001. Africa and Iberia in the Pleistocene. *Quaternary International* **75**:91-102.

Straus, L. G., and Bar-Yosef, O. 2001. Editorial. Out of Africa in the Pleistocene: an introduction. *Quaternary International* **75**:1-3.

Stringer, C. 2002. Modern human origins: progress and prospects. *Philosophical Transactions of the Royal Society of London Series B* **357**:563-579.

Stringer, C. B., Andrews, P., and Currant, A. P. 1996. "Palaeoclimatic significance of mammalian faunas from Westbury Cave, Somerset, England," in *The early Middle Pleistocene in Europe*. Edited by C. Turner, pp. 135-143. Rotterdam: Balkema.

Stringer, C. B., and Hublin, J.-J. 1999. New age estimates for the Swanscombe hominid, and their significance for human evolution. *Journal of Human Evolution* **37**:873-877.

Strobl, J., and Obermaier, H. 1909. Die Aurignacienstation von Krems. *Jahrbuch fur Altertumskunde* **3**:129-148.

Stuart, A. J. 1982. *Pleistocene Vertebrates in the British Isles*. London: Longman.

Stuart, A. J. 1996. "Vertebrate faunas from the early Middle Pleistocene of East Anglia," in *The early Middle Pleistocene in Europe*. Edited by C. Turner, pp. 9-24. Rotterdam: Balkema.

Stuart, A. J., and Lister, A. M. 2000. "Pakefield, Suffolk," in *The Quaternary of Norfolk and Suffolk. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and R. C. Preece, pp. 219-223. London: Quaternary Research Association.

Suarez, A. V., Tsutsui, N. D., Holway, D. A., and Case, T. J. 1999. Behavioral and genetic differentiation between native and introduced populations of the Argentine ant. *Biological Invasions* **1**:43-53.

Susman, R. L. 1991. Who made the Oldowan tools- Fossil evidence for tool behavior in Plio-Pleistocene hominids. *Journal of Anthropological Research* **47**:129-151.

Svoboda, J., Ložek, V., Svobodová, H., and Škrdla, P. 1994. Predmostí after 110 Years. *Journal of Field Archaeology* **21**:457-472.

Svoboda, J., Ložek, V., and Vlcek, E. 1996. *Hunters between East and West. The Paleolithic of Moravia*. New York: Plenum Press.

Swainston, S. 2000. "The lithic artefacts from Paviland," in *Paviland Cave and the Red Lady: A Definitive Report*. Edited by S. Aldhouse-Green, pp. 95-113. Bristol: Western Academic and Specialist Press Ltd.

Swenson, J. E., Sandegren, F., and Soderberg, A. 1998. Geographic expansion of an increasing brown bear population: evidence for presaturation dispersal. *Journal of Animal Ecology* **67**:819-826.

Swisher, C. C., Curtis, G. H., Jacob, T., Getty, A. G., and Suprijo, A. 1994. Age of the earliest known hominids in Java, Indonesia. *Science* **263**:1118-1121.

Tappen, M., Adler, D. S., Ferring, C. R., Gabunia, M., Vekua, A., and Swisher, C. C. 2002. Akhalkalaki: The Taphonomy of An Early Pleistocene Locality in the Republic of Georgia. *Journal of Archaeological Science* **29**:1367-1391.

Tavoso, A. 1973. La station acheuléenne de Chaubard à Grazac (Tarn). *Bulletin de la Société Préhistorique Française* **70**:103-107.

Tavoso, A. 1976a. "Les premières industries humaines dans le Bassin du Tarn," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 797-799. Paris: Centre National de la Recherche Scientifique.

Tavoso, A. 1976b. "L'Acheuléen dans le bassin du Tarn," in *L'Évolution de l'Acheuléen en Europe*. Edited by J. Combier, pp. 114-133. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Taylor, H. 1928. King Arthur's Cave, near Whitchurch, Ross-on-Wye. *Proceedings of the University of Bristol Spelaeological Society* **3**:59-83.

Tchernov, E. 1987. The age of the 'Ubeidiya Formation, an Early Pleistocene Hominid site in the Jordan Valley, Israel. *Israel Journal of Earth Sciences* **36**:3-30.

Tchernov, E. 1988. "The paleobiogeographical history of the Southern Levant," in *The Zoogeography of Israel*. Edited by Y. Yom-Tov and E. Tchernov, pp. 159-250. Dordrecht: W. Junk Publishers.

Tchernov, E., Horwitz, L. K., Ronen, A., and Lister, A. 1994. The Faunal Remains from Evron Quarry in Relation to Other Lower Paleolithic Hominid Sites in the Southern Levant. *Quaternary Research* **42**:328-339.

Terrell, J. 1990. Storytelling and Prehistory. *Archaeological Method and Theory* **2**:1-30.

Thévenin, A. 1991. "Les premiers peuplements humains de l'Est de la France," in *Les Premiers Européens. Actes du 114e Congrès National des Sociétés Savantes (Paris, 3-9 avril 1989)*. Edited by E. Bonifay and B. Vandermeersch, pp. 47-54. Paris: Editions du C.T.H.S.

Thibault, C. 1976. "Les premières industries humaines dans le Sud-Ouest," in *La Préhistoire Française*. Edited by H. de Lumley, pp. 800. Paris: Centre National de la Recherche Scientifique.

Thieme, H., and Maier, R. 1995. *Archäologiche Ausgrabungen im Braunkohlentagebau Schöningen: Landkreis Helmstedt*. Hannover: Verlag Hahnsche Buchhandlung.

Thorne, A., and Wolpoff, M. 1992. The multiregional evolution of modern humans. *Scientific American* **266**:76-83.

Thouveny, N., and Bonifay, E. 1984. New chronological data on European Plio-Pleistocene faunas and hominid occupation sites. *Nature* **308**:355-358.

Tilley, C. 1999. *Metaphor and Material Culture*. Oxford: Blackwell.

Tilly, C. 1978. "Migration in Modern European History," in *Human Migration: Patterns and Policies*. Edited by W. McNeill and R. Adams, pp. 48-74. Bloomington: Indiana University Press.

Tixier, J., and Inizan, M.-L. 1981. "Ksar 'Aqil: stratigraphie et ensembles lithiques dans le paléolithique supérieur fouilles 1971-1975," in *Préhistoire du Levant: Chronologie et organisation de l'espace depuis les origines jusqu'au VIe millénaire*. Edited by J. Cauvin and P. Sanlaville, pp. 353-367. Paris: Centre National de la Recherche Scientifique.

Tostevin, G. 2000. "The Middle to Upper Paleolithic Transition from the Levant to Central Europe: in situ development or diffusion?," in *Neanderthals and*

Modern Humans- Discussing the Transition: Central and Eastern Europe from 50.000-30.000 B.P. Edited by J. Orschiedt and G.-C. Weniger, pp. 92-111. Mettmann: Neanderthal Museum.

Tournepiche, J.-F. 1984. Faunes et industries antérissiennes de la grotte d'Artenac (Charente). *Comptes Rendus de l'Academie de Sciences de Paris serie II* **298**:423-428.

Toussaint, M., Becker, A., and Lacroix, P. 1998. Recherches 1997-1998 aux grottes de Goyet, à Gesves, province de Namur. *Notae Praehistoricae* **18**:33-44.

Tratman, E. K. 1964. Picken's Hole, Crook Peak, Somerset. A Pleistocene Site. Preliminary Note. *Proceedings of the University of Bristol Spelaeological Society* **10**:112-115.

Tratman, E. K., Donovan, D. T., and Campbell, J. B. 1971. The Hyaena Den (Wookey Hole), Mendip Hills, Somerset. *Proceedings of the University of Bristol Spelaeological Society* **12**:245-279.

Tuffreau, A. 1971. Quelques observationssur le Paléolithique de la Pointe-aux-Oies à Wimereux (Pas-de-Calais). *Bulletin de la Société Préhistorique Française* **68**:496-504.

Tuffreau, A. 1976. "Acheuléen et industries apparentées dans le Nord de la France et le bassin de la Somme," in *L'Évolution de l'Acheuléen en Europe*. Edited by J. Combier, pp. 93-109. Nice: Union Internationale des Sciences Préhistoriques et Protohistoriques.

Tuffreau, A., Munaut, A. V., Puisségur, J. J., and Sommé, J. 1982. Stratigraphie et environnement des industries acheuléennes de la moyenne terrasse du bassin de la Somme (région d'Amiens). *Bulletin de l'Association Française pour l'Etude du Quaternaire* **10-11**:73-82.

Tuffreau, A., and Antoine, P. 1995. "The earliest occupation of Europe: Continental Northwestern Europe," in *The Earliest Occupation of Europe. Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 147-163. Leiden: University of Leiden Press.

Turner, A. 1982. Hominids and Fellow Travellers. *South African Journal of Science* **78**:231-237.

Turner, A. 1995. "Regional Variations in Lower and Middle Pleistocene Larger Mammal Faunas of Europe: An Iberian Perspective," in *Human Evolution in Europe and the Atapuerca Evidence.* Edited by J. M. Bermudez, J. L. Arsuaga, and E. Carbonell, pp. 57-73. Junta de Castilla y Leon: Consejeria de Cultura y Turismo.

Turner, A. 1999. Assessing earliest human settlement of Eurasia: Late Pliocene dispersions from Africa. *Antiquity* **73**:563-570.

Turner, A. 2000a. "The Paviland mammalian fauna," in *Paviland Cave and the Red Lady: A Definitive Report.* Edited by S. Aldhouse-Green, pp. 133-140. Bristol: Western Academic and Specialist Press Ltd.

Turner, E. 2000b. *Miesenheim 1: Excavations at a Lower Palaeolithic site in the Central Rhineland of Germany.* Bonn: Verlag des Römisch-Germanischen Zentralmuseums in Kommission bei Dr. Rudolf Habelt GMBH.

Udvardy, M. D. F. 1969. *Dynamic Zoogeography.* New York: Van Nostrand Reinhold Company.

Vallespí, E., Díaz del Olmo, F., Alvarez, G., and Vallespí García, E. 1988. Secuencia paleolítica del Bajo Guadalquivir. *Revista de Arqueología* **82**:9-17.

Vallespí Pérez, E. 1987. Sobre el Paleolítico Inferior inicial de la Península Ibérica. *Veleia* **4**:51-66.

Valoch, K. 1977. První staropaleolitické valounové industrie z jižní Moravy. *Archeologické Rozhledy* **29**:481-486.

Valoch, K. 1995. "The earliest occupation of Europe: Eastern Central and Southeast Europe," in *The Earliest Occupation of Europe: Proceedings of the European Science Foundation Workshop at Tautavel (France), 1993.* Edited by W. Roebroeks and T. van Kolfschoten, pp. 67-84. Leiden: University of Leiden Press.

Valoch, K. 1996a. Das Mittelwürm in den Lössen Südmährens und seine paläolithischen Kulturen. *Eiszeitalter und Gegenwart* **46**:54-64.

Valoch, K. 1996b. *Le Paléolithique en Tchéquie et en Slovaquie.* Grenoble: Jerome Millon.

van Andel, T. H. 2003. "Glacial Environments I: the Weichselian Climate in Europe between the End of the OIS-5 Interglacial and the Last Glacial Maximum," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project.* Edited by T. H. van Andel and W. Davies, pp. 9-19. Cambridge: McDonald Institute for Archaeological Research.

van Andel, T. H., and Davies, W. Editors. 2003. *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project. McDonald Institute Monographs.* Cambridge: McDonald Institute for Archaeological Research.

van Andel, T. H., Davies, W., and Weninger, B. 2003a. "The Human Presence in Europe during the Last Glacial Period 1: Human Migrations and the Changing

Climate," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project.* Edited by T. H. van Andel and W. Davies, pp. 31-56. Cambridge: McDonald Institute for Archaeological Research.

van Andel, T. H., Davies, W., Weninger, B., and Jöris, O. 2003b. "Archaeological Dates as Proxies for the Spatial and Temporal Human Presence in Europe: a Discourse on the Method," in *Neanderthals and modern humans in the European landscape during the last glaciation: archaeological results of the Stage 3 Project.* Edited by T. H. van Andel and W. Davies, pp. 21-29. Cambridge: McDonald Institute for Archaeological Research.

van der Made, J. 1999. Ungulates from Atapuerca TD6. *Journal of Human Evolution* **37**:389-413.

van der Meulen, A. J. 1973. Middle Pleistocene Smaller Mammals from the Monte Peglia, (Orvieto, Italy) with Special Reference to the Phylogeny of Microtus (Arvicolidae, Rodentia). *Quaternaria* **17**:1-144.

Vandermeersch, B., and Tillier, A. M. 1983. La dent humaine de Vergranne. *Annales Scientifiques de l'Université de Besançon 4ème série* **5**:27-30.

Vandermeersch, B. 1989. "The evolution of modern humans: recent evidence from south-west Asia," in *The human revolution.* Edited by P. Mellars and C. Stringer, pp. 155-164. Edinburgh: Edinburgh University Press.

Vaquero, M., and Carbonell, E. 2000. "The Late Middle Palaeolithic in the Northeast of the Iberian Peninsula," in *Neanderthals on the Edge: Papers from a conference marking the 150th anniversary of the Forbes' Quarry discovery, Gibraltar.* Edited by C. B. Stringer, R. N. E. Barton, and J. C. Finlayson, pp. 69-83. Oxford: Oxbow Books.

Vekua, A., Lordkipanidze, D., Rightmire, G. P., Agusti, J., Ferring, R., Maisuradze, G., Mouskhelishvili, A., Nioradze, M., Ponce de Leon, M., Tappen, M., Tvalchrelidze, M., and Zollikofer, C. 2002. A New Skull of Early *Homo* from Dmanisi, Georgia. *Science* **297**:85-89.

Vermeersch, P. M. 2001. Out of Africa from an Egyptian point of view. *Quaternary International* **75**:103-112.

Verron, G. 1977. Circonscription de Haute et Basse Normandie. *Gallia Préhistoire* **20**:367-368.

Vértes, L. 1955. Neuere ausgrabungen und paläolithische funde in der höhle von Istállósko. *Acta Archaeologia Academiae Scientiarum Hungaricae* **5**:111-131.

Villa, P. 1983. *Terra Amata and the Middle Pleistocene Archaeological Record of Southern France*. Berkeley: University of California.

Villa, P. 2001. Early Italy and the colonization of Western Europe. *Quaternary International* **75**:113-130.

Villaverde, V., Aura, J. E., and Barton, C. M. 1998. The Upper Palaeolithic in Mediterranean Spain: A Review of Current Evidence. *Journal of World Prehistory* **12**:121-198.

Virgos, E., and Casanovas, J. G. 1999. Environmental constraints at the edge of a species distribution, the Eurasian badger (Meles meles L.): a biogeographic approach. *Journal of Biogeography* **26**:559-564.

Vitousek, P. M. 1986. "Biological Invasions and Ecosystem Properties: Can Species Make a Difference?," in *Ecology of Biological Invasions of North America and Hawaii*. Edited by H. A. Mooney and J. A. Drake, pp. 163-176. New York: Springer-Verlag.

Vollbrecht, J. 1995a. "Achenheim," in *Quaternary field trips in Central Europe vol.2.* Edited by W. Schirmer, pp. 855-857. Munich: Verlag Dr. Friedrich Pfeil.

Vollbrecht, J. 1995b. "Mauer," in *Quaternary field trips in Central Europe vol.2.* Edited by W. Schirmer, pp. 861-865. Munich: Verlag Dr. Friedrich Pfeil.

Vollbrecht, J. 1997. *Untersuchungen zum Altpaläolithikum im Rheinland.* Bonn: Verlag Dr. Rudolf Habelt Gmbh.

von Berg, A., and Fiedler, L. 1983. Altpaläolithische funde von Winningen und Koblenz-Bisholder an der unteren Mosel. *Archäologisches Korrespondenzblatt* **13**:291-298.

Waechter, J. d. A. 1951. Excavations at Gorham's Cave, Gibraltar. *Proceedings of the Prehistoric Society* **17**:83-92.

Waters, M. R. 1992. *Principles of geoarchaeology : a North American perspective.* Tucson: University of Arizona Press.

Watts, D. 1971. *Principles of Biogeography: An Introduction to the Functional Mechanisms of Ecosystems.* New York: McGraw-Hill Book Company.

Weber, T. 1977. Clactonienfunde von Memleben, Kr. Nebra. *Ausgrabungen und Funde* **22**:195-199.

Wegner, H.-H., and Ament, H. 1986. Koblenz und der Kreis Mayen-Koblenz. *Führer zu archäologischen Denkmälern in Deutschland* **12**.

Wendorf, F., and Schild, R. 1980. *Prehistory of the Eastern Sahara.* New York: Academic Press.

Wernert, P. 1957. Stratigraphie paléontologique et préhistorique des sédiments quaternaires d'Alsace, Achenheim. *Mémoires du Service de la Carte Géologique d'Alsace et de Lorraine* **14**:1-259.

White, C. 1995. La Grotte du Vallonnet: Evidence of early hominid activity or natural processes? *Lithics* **16**:70-77.

White, H. 1973. *Metahistory: The Historical Imagination in Nineteenth-Century Europe*. Baltimore: The John Hopkins University Press.

White, H. 1978. "Introduction: Tropology, discourse, and the modes of human consciousness," in *Tropics of Discourse: Essays in Cultural Criticism*. Edited by H. White, pp. 1-25. Baltimore: The John Hopkins University Press.

White, H. 1987. "The Value of Narrativity in the Representation of Reality," in *The Content of the Form: narrative discourse and historical representation*. Edited by H. White, pp. 1-25. Baltimore: The John Hopkins University Press.

White, M., and Ashton, N. 2003. Lower Palaeolithic Core Technology and the Origins of the Levallois Method in North-Western Europe. *Current Anthropology* **44**:598-609.

White, M. J. 1998. "Palaeolithic Archaeology of the Stour terraces," in *The Quaternary of Kent and Sussex. Field Guide*. Edited by J. B. Murton, C. A. Whiteman, M. R. Bates, D. R. Bridgland, A. J. Long, M. B. Roberts, and M. P. Waller, pp. 50-52. London: Quaternary Research Association.

White, M. J. 2000. The Clactonian Question: On the Interpretation of Core-and-Flake Assemblages in the British Lower Palaeolithic. *Journal of World Prehistory* **14**:1-63.

Whittaker, R. H. 1975. *Communities and Ecosystems*. New York: MacMillan Press.

Williamson, M. 1996. *Biological Invasions*. London: Chapman and Hall.

Wilson, T. D. 1994. What Determines Where Transnational Labor Migrants Go? Modifications in Migration Theories. *Human Organization* **53**:269-278.

Wood, J. W. 1998. A Theory of Preindustrial Population Dynamics: Demography, Economy, and Well-Being in Malthusian Systems. *Current Anthropology* **39**:99-135.

Woodcock, A. 1986. "The Lower and Middle Palaeolithic in Sussex. A Summary of Current Knowledge, Present Research and Future Objectives," in *The Palaeolithic of Britain and its Nearest Neighbours: Recent Trends*. Edited by S. N. Collcutt, pp. 31-35. Sheffield: University of Sheffield.

Woodward, F. I. 1987. *Climate and Plant Distributions*. Cambridge: Cambridge University Press.

Würges, K. 1984. Altpaläolithische funde aus der Tongrube Kärlich (Schicht H, Unten), kreis Mayen-Koblenz Neuwieder Becken. *Archäologisches Korrespondenzblatt* **14**:17-22.

Würges, K. 1986. Artefakte aus den ältesten quartärsedimenten (schichten A-C) der Tongrabe Kärlich, kreis Mayen-Koblenz/Neuwieder Becken. *Archäologisches Korrespondenzblatt* **16**:1-6.

Wurz, S. 2002. Variability in the Middle Stone Age Lithic Sequence, 115,000-60,000 Years Ago at Klasies River, South Africa. *Journal of Archaeological Science* **29**:1001-1015.

Wymer, J. 1985. *Palaeolithic Sites of East Anglia*. Norwich: Geo Books.

Wymer, J. 1999. *The Lower Palaeolithic Occupation of Britain*. Salisbury: Trust for Wessex Archaeology.

Wymer, J. 2001. "Palaeoliths in a lost pre-Anglian landscape," in *A Very Remote Period Indeed: Papers on the Palaeolithic presented to Derek Roe*. Edited by S. Milliken and J. Cook, pp. 174-179. Oxford: Oxbow Books.

Wymer, J. J., Lewis, S. G., and Bridgland, D. R. 1991. "Warren Hill, Mildenhall, Suffolk (TL 744743)," in *Central East Anglia and the Fen Basin. Field Guide*. Edited by S. G. Lewis, C. A. Whiteman, and D. R. Bridgland, pp. 50-58. London: Quaternary Research Association.

Wynn, J. G. 2004. Influence of Plio-Pleistocene Aridification on Human Evolution: Evidence From Paleosols of the Turkana Basin, Kenya. *American Journal of Physical Anthropology* **123**:106-118.

Wynn, T. 1979. The intelligence of later Acheulean hominids. *Man* **14**:371-391.

Yalçinkaya, I., Otte, M., Bar-Yosef, O., Kozlowski, J., Leotard, J.-M., and Taskiran, H. 1992. Karain 1991: Recherches Paléolithiques en Turquie du sud, rapport provisoire. *Paléorient* **18**:109-122.

Yi, S., and Clark, G. A. 1983. Observations on the Lower Palaeolithic of Northeast Asia. *Current Anthropology* **24**:181-202.

Yizraeli, T. 1967. A Lower Palaeolithic site at Holon. *Israel Exploration Journal* **17**:144-152.

Yom-Tov, Y., Yom-Tov, S., and Moller, H. 1999. Competiton, coexistence, and adaptation amongst rodent invaders to Pacific and New Zealand islands. *Journal of Biogeography* **26**:947-958.

Zilhao, J., and d'Errico, F. 1999. Reply. *Current Anthropology* **40**:355-360.

Zilhão, J. 1997. *O Paleolitico Superior da Estremadura Portugesa*. Lisbon: Edicoes Colibri.

Zilhão, J., and d'Errico, F. 1999. The Chronology and Taphonomy of the Earliest Aurignacian and Its Implications for the Understanding of Neanderthal Extinction. *Journal of World Prehistory* **13**:1-68.

Zilhão, J. 2000. "The Ebro Frontier: A Model for the Late Extinction of Iberian Neanderthals," in *Neanderthals on the Edge: Papers from a conference marking the 150th anniversary of the Forbes' Quarry discovery, Gibraltar.* Edited by C. B. Stringer, R. N. E. Barton, and J. C. Finlayson, pp. 111-121. Oxford: Oxbow Books.

Zipf, G. K. 1946. The P_1P_2 Hypothesis on the Intercity Movement of Persons. *American Sociological Review* **11**:677-686.